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FLOOD INSURANCE STUDY

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COUNTY OF SUMMIT, OHIO

UNINCORPORATED AREAS

OCTOBER 15, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 390781

FEMI.209:

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Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

COUNTY OF SUMMIT
UNINCORPORATED AREAS, OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the unincorporated areas of Summit County, Ohio, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the unincorporated areas of Summit County to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR 60.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Dalton-Dalton-Newport/Polytech, Inc., for the Federal Insurance Administration, under Contract No. H-4732. This study was completed in August 1979.

1.3 Coordination

The Consultation Coordination Officer (CCO), appointed by the Federal Insurance Administrator, organized the first community meeting, held on March 8, 1978. This meeting, attended by representatives of Summit County, the FIA, the Ohio Department of Natural Resources (ODNR), and Dalton-Dalton-Newport/Polytech, Inc., was held to explain the nature and purpose of the Flood Insurance Study and to determine the limits of detailed and approximate study. The ODNR served as state Coordinating Agency for this study.

A legal notice announcing the beginning of the study and stating its objectives was placed in the Akron Beacon Journal on August 18, 1978.

Contact was maintained during the course of this study with the Summit County Engineer's office, the Canal Division of the ODNR, the U.S. Geological Survey (USGS), and the U.S. Army Corps of Engineers (COE) for general community information. General hydrologic data were obtained from the Columbus, Ohio, USGS and the ODNR.

On September 17, 1979, an informal meeting was held with county officials to review the preliminary floodway calculations and the preliminary report.

On May 15, 1980, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of Summit County along with officials and representatives of the FIA, the ODNR, and the Study Contractor.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Summit County. The area of study is shown on the Vicinity Map (Figure 1).

Excluded from this study are the incorporated areas of the Cities of Akron, Barberton, Cuyahoga Falls, Tallmadge, Fairlawn, Macedonia, and Norton; and the Villages of Hudson, Clinton, Boston Heights, Mogadore, and Silver Lake. Also excluded are the incorporated areas of Lakemore, Peninsula, Munroe Falls, Northfield, Reminderville, Richfield, Stow, and Twinsburg. No extraterritorial areas were included in this study.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through August 1984.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the FIA and the unincorporated areas of Summit County.

The flooding sources studied by detailed methods are listed below:

a. Tinkers Creek from the Ohio Turnpike to the east county boundary;

b. Tinkers Creek Tributary from its confluence to Hudson-Aurora Road;

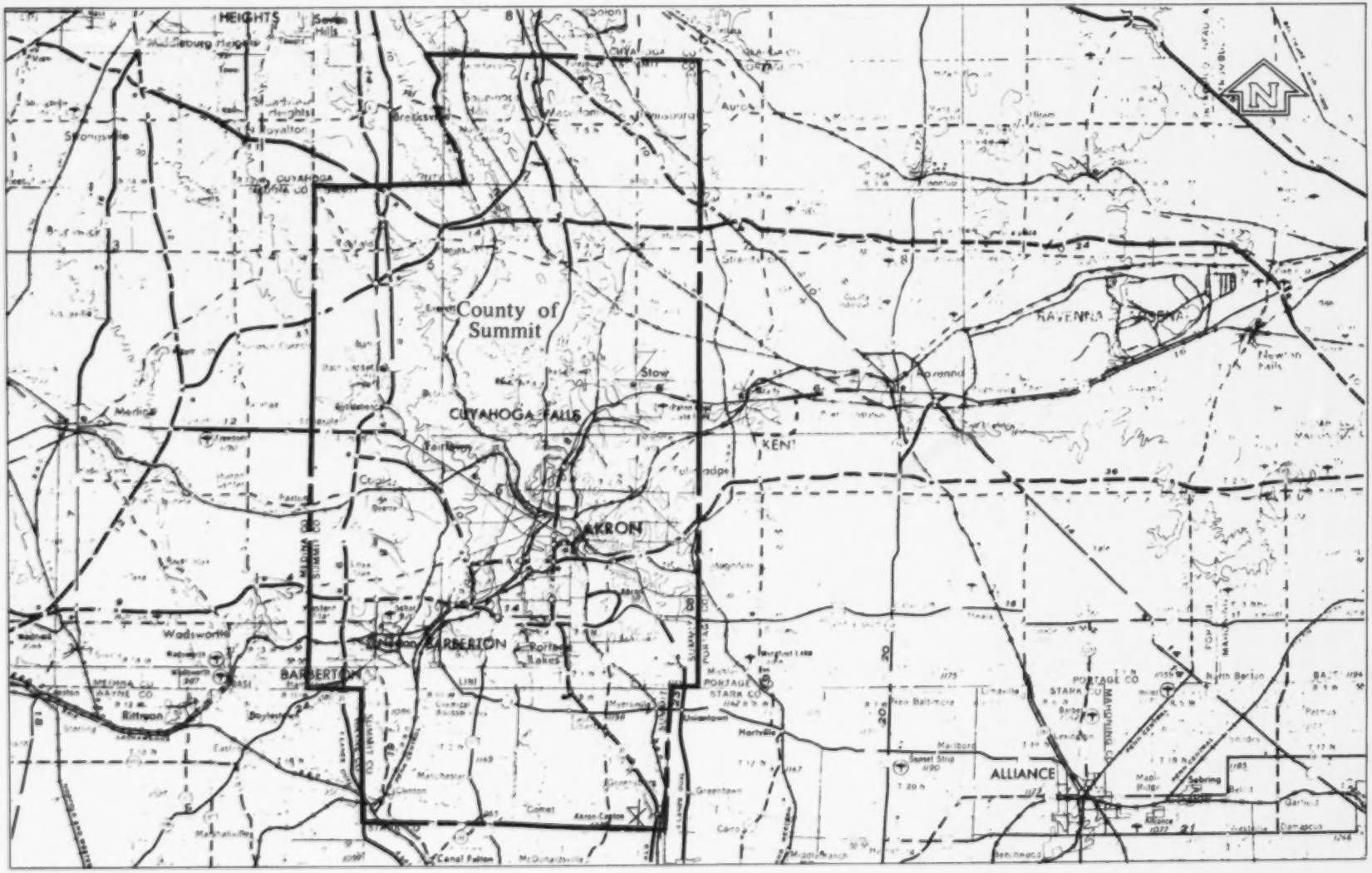

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

6 0 6 12 24 MILES

VICINITY MAP

c. Brandywine Creek from Brandywine Road upstream to the Village of Hudson corporate limit;

d. the Little Cuyahoga River from the City of Akron corporate limit upstream to the Village of Mogadore corporate limit;

e. the Tuscarawas River from the Village of Clinton corporate limit to the City of Norton corporate limit, and from a point about 1,300 feet downstream of Interstate 77 to just upstream of State Route 8;

f. Yellow Creek from the City of Akron corporate limit to about 500 feet upstream of Crystal Lake Road;

g. North Branch Yellow Creek from its confluence to Bath Road;

h. North Branch Yellow Creek Tributary from its confluence to Bath Road;

i. Pigeon Creek from the City of Norton corporate limit to the City of Akron corporate limit, and from the City of Akron corporate limit to Ridgewood Road;

j. Pigeon Creek Tributary 2 from the City of Norton corporate limit to Jacoby Road; and

k. Wolf Creek from the Barberton Reservoir to the west county boundary.

Approximate flood boundaries for the Cuyahoga River, the Little Cuyahoga River, Tinkers Creek, Pond Brook, Mud Brook, Powers Brook, the East Branch of the Rock River, North Branch Yellow Creek, Yellow Creek, the Barberton Reservoir, Schocalog Run, Pancake Creek, Pigeon Creek, Wolf Creek, Nimisilla Creek, the Tuscarawas River, Long Lake, North Reservoir, Homer Lake, Springfield Lake, Wyoga Lake, Brandywine Creek, Crystal Lake, 22 unnamed tributaries, and the Ohio Canal, located within Summit County, were also studied.

2.2 Community Description

Summit County is located in the northeastern portion of Ohio. The total unincorporated land area contained within the county limits is 234.5 square miles. Summit County is situated 30 miles south of Cleveland on the divide between the Tuscarawas River basin and the Cuyahoga River basin. According to U.S. Census Bureau figures, the population of Summit County has decreased from 104,194 in 1960 to 98,711 in 1970, mostly due to an increase in incorporated areas (Reference 1). The county is bordered by Wayne County, Stark County, Portage County, Geauga County, and Cuyahoga County; and the incorporated areas of the Cities of Cleveland and Aurora.

The climate in northern Ohio is characteristically midcontinental, moderated by close proximity to Lake Erie. Summer and winter temperatures range from a mean high of 72.4 degrees Fahrenheit (F.) in July to a mean low of 27.4 degrees F. in January, respectively, with a high of 104 degrees F. recorded in August 1918, and a low of -20 degrees F. recorded in February 1899. Annual average precipitation for the region is 37.3 inches, with an average recorded snowfall of 52.5 inches. The precipitation is distributed throughout the year with the maximum received in April (about 4 inches average) and the minimum in October (about 2.5 inches average). The maximum 24-hour rainfall was 5.96 inches recorded in July 1943, and the maximum 24-hour snowfall was 15.96, recorded in 1901 (Reference 2).

Summit County is located on the continental divide separating the Muskingum River and the Ohio River watersheds from the St. Lawrence watershed. Land surface in the community is dominated by glacial deposits of the Wisconsin age glacier. The general soil classification adjacent to the Cuyahoga River and Tinkers Creek in Summit County is of the Chagrin-Holly-Lobdell association, characterized by moderately well-drained soils formed in medium-textured recent alluvium. The Ohio and Erie Canal in the southern portion of Summit County is in the nearly level, very poorly drained, organic soils of the Carlisle association. The central metropolitan areas are of the Chili and Canfield-Wooster associations, with extensive urban land intermixed. Chili association soils are nearly level to steep, well-drained, sandy and gravelly glacial outwashes. The Little Cuyahoga River flows through Chili soils in the upper study reaches, and then through rough, very steep, land types below its confluence with Camp Brook. The Tuscarawas River, along with Wolf and Pigeon Creeks, is also within the well-drained glacial Chili deposits. The Canfield-Wooster association is characterized by moderately steep, moderately well-drained, medium-textured glacial till, and in Summit County comprises significant drainage areas on both the east and west sides of the City of Akron. Yellow Creek flows through a rough broken association typical of the Little Cuyahoga River basin (Reference 3).

Development in Summit County ranges from residential to commercial to heavy industrial, and includes the manufacturing and production of chemicals and rubber products. Development in the flood plain is generally industrial and commercial, with related rail transportation along the Cuyahoga and Tuscarawas Rivers. Development along a portion of Pigeon Creek, Brandywine Creek, and Yellow Creek is commercial and residential, with residential development in the flood plain of Tinkers Creek and the Ohio Canal. The flood plain of Wolf Creek is currently undeveloped; however, residential development is expected to commence in the next five years.

2.3 Principal Flood Problems

The past history of flooding on streams within Summit County indicates that flooding may occur during any season of the year. Most major floods occur

during late winter and spring and are usually the result of spring rains and/or snowmelt. However, summer cyclonic storms, moving out of the southwest, have produced rainfall of high intensity over the study area and contribute to severe flooding problems in Summit County.

Historically, the worst flood in Summit County occurred in March 1913. During a 60-hour period, approximately 10 inches of rain fell over wide areas. The Little Cuyahoga River spilled over its banks and destroyed approximately 30 homes in Akron. The East Reservoir of the Portage Lakes chain burst and sent a tremendous quantity of water into the Ohio and Erie Canal, destroying several locks and damaging adjacent properties. The canal was never reconstructed for commerce, and today remains only as a supply channel for process water to industries.

Summit County has experienced a number of major floods during this century, with flooding problems occurring on an average of once in three to five years. The greatest flood of record occurred in 1913 and had an estimated period of recurrence of approximately 100 years. Other notable floods occurred in August 1946 (35- to 40-year recurrence); March 1933 (20- to 25-year recurrence); January 1959 (15-year recurrence); and in 1939 and 1943 (approximately 10-year recurrence). Several recent floods have occurred in 1969, 1975, 1976, and 1977. These floods had recurrence periods of three to seven years.

Flooding in Summit County has been compounded by ice and other material obstructing structures and waterways. However, prompt action on the part of the county has limited compounding of flood problems. For this reason, ice jamming was not considered in the calculations for this report. Little structural damage has been recorded in Summit County over the past 50 years, with the major loss being limited to water damage to homes and businesses.

Scenes of the community are included in Figures 2 through 5, and scenes of flood problems in the county are shown in Figures 6 through 9.

2.4 Flood Protection Measures

The severity of flooding experienced in 1913 is not likely to recur, in view of the significant improvements which have since been constructed in both the Cuyahoga River and Tuscarawas River drainage basins. East Branch Reservoir, LaDue Reservoir, and Lake Rockwell Reservoir presently control about 205 square miles of Cuyahoga River drainage area and have a significant modifying effect upon flood discharges in the upper basin. Mogadore Reservoir has a similar effect upon the Little Cuyahoga River by controlling 12 square miles of headwater area. These 4 reservoirs serve in domestic and industrial water supply and flood control efforts. In addition, a gated flood control works has been constructed at Long Lake outlet to the Tuscarawas River. The City of Barberton has constructed a reservoir in

FIGURE 2 - Looking east at Twin Lakes Drive on the Tuscarawas River in the eastern portion of Summit County. Recent development has taken place in this area (Photograph by David Base Photography, Akron, Ohio).

FIGURE 3 - Looking east at the Tritts Millpond Dam on the Tuscarawas River in the eastern portion of Summit County. Also shown is the Massilon Road bridge (Photograph by David Base Photography, Akron, Ohio).

FIGURE 4 - Looking southwest at the Tuscarawas River as it flows through the Tailing piles near the Barberton corporation line (Photograph by David Base Photography, Akron, Ohio).

FIGURE 5 - Looking north at the Tuscarawas River in southwestern Summit County near the Village of Clinton, Ohio (Photograph by David Base Photography, Akron, Ohio).

FIGURE 6 - Evidence of flood damage from the 1938 flood of Yellow Creek and its tributary between Wye Road and Granger Road in Summit County (Courtesy of Mr. L.W. Swartz).

FIGURE 7 - Flooding of the Little Cuyahoga River in July 1972, at Case Avenue and Park Street in the City of Akron, Ohio (Courtesy of the Akron Beacon Journal and David Base Photography, Akron, Ohio).

FIGURE 8 - Flooding of the Ley Ditch at South Main Street extension in July 1972 (Courtesy of the Akron Beacon Journal and David Base Photography, Akron, Ohio).

FIGURE 9 - Flooding of Yellow Creek and its tributary at Granger Road in Summit County, Spring 1938 (Courtesy of Mr. L.W. Swartz).

Wolf Creek. Intended as a water supply reservoir, this structure has a modifying effect on flood hydrology. In view of these alterations, it is apparent that the storm drainage basin characteristics in Summit County are significantly improved over those which existed in 1913, and, as such, flooding hazards are of lesser magnitude in comparison.

The county lies in close proximity to the Akron-Canton Airport Weather Station established by the National Oceanic and Atmospheric Administration; therefore, Summit County benefits from a flood warning system operated there. This fact, coupled with prompt action on the part of the county, has contributed much to reducing damage and preventing loss of life during floods. In addition, Summit County has cleaned Mud Run and Pigeon Creek and has widened many areas, which reduces flooding by improving characteristics in the channel.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

Hydrologic analysis for ungaged streams in the study area was done using the method described in Bulletin No. 45, Floods in Ohio, Magnitude and Frequency (Reference 4). The procedures provided by Bulletin No. 45 calculate the peak flood discharges for storms of selected recurrence intervals using regression exponents for significant hydrologic and basin characteristics. These were developed by regional analysis using multiple

regression techniques and datum from stream gages in areas of similar hydrologic characteristics. The Bulletin No. 45 procedures have been adapted to computer methods by the computer program HY-45 (Reference 5) developed by Dalton-Dalton-and Newport for use with Flood Insurance Studies. This method is consistent with the hydrologic calculations currently being done by all state agencies. Since hydrologic calculations for ungaged streams are based on streamflow records, they include consideration of both rainfall and snowmelt conditions and provide adequate consideration for multiple events. This procedure has been reviewed by the USGS and they are in agreement that adequate consideration for snowmelt has been provided.

In areas of high density development, an urbanization factor was developed and applied to HY-45 calculations using the method of basin evaluation currently in use by the Ohio Department of Transportation (ODOT). The streams studied by this method include Brandywine Creek, Yellow Creek and its tributaries, and Tinkers Creek Tributary.

Hydrologic analysis for gaged streams in the study area was done using the method described in Bulletin No. 17, Guidelines for Determining Flood Flow Frequencies (Reference 6). Procedures provided in Bulletin No. 17 calculate the peak flood discharges for the required years of recurrence using a log-Pearson Type III statistical analysis of recorded annual peak flows. Since this method is based on actual streamflow, no additional consideration need be given to snowmelt conditions.

Flows on gaged streams for study sites with drainage areas over 5 percent but not more than 100 percent larger or less than 5 percent but not less than 50 percent smaller than the drainage area at the gage site are adjusted by the method described in Bulletin No. 45. Stream gages in the study area which meet the requirements of Bulletin No. 17 are shown in the following table:

Stream gages in the Study Area

Stream	Gage No.	Location	Period of Record
Tuscarawas River	0311600	Clinton, Ohio	51 years
Chippewa Creek	03116200	Easton, Ohio	19 years
Cuyahoga River	04206000	Akron, Ohio	53 years
Little Cuyahoga River	04204000	Mogadore, Ohio	32 years
Springfield Lake Outlet	04205000	Akron, Ohio	28 years
Little Cuyahoga River	04204500	Akron, Ohio	29 years

During a review of the gage calculations, immediate note was made of the significant discrepancy that existed between the log-Pearson calculations and the values for the 100-year flood flow that were obtained from the COE and Bulletin No. 45 calculations. This was particularly evident in the Tuscarawas River basin. While exact values on the flows resulting from regulation are nonexistent, it becomes evident that regulation plus natural storage may be expected to produce a significant impact on basin hydrology.

Flood flow values for the gages downstream (south) of the study area at Easton (Chippewa Creek), and in an adjacent watershed (west) at Massillon (Tuscarawas River) were reviewed to determine if significant characteristics could be obtained for use in the upper Tuscarawas River evaluation. The results of this review showed that the Easton gage records produced flow calculations significantly closer to the Bulletin No. 45 method and in general agreement with the regression curve data provided for Hydrologic Zone 5. The Massillon gage also produced calculations closer to the regression curves; however, this gage appears to be affected by the lag noted in the upper Tuscarawas River basin.

The discrepancies between gage calculations and other data indicate that the Bulletin No. 45 method would not produce valid regression calculations for the portion of the Tuscarawas basin in Summit County. As stated in Bulletin No. 45, the gage adjustment procedures break down at 50 percent of the drainage basin, or near the mouth of Wolf Creek. For these reasons, other methods were investigated as a possible procedure for hydrologic calculations on the ungaged streams, particularly in the Tuscarawas basin.

The approach selected to adjust calculated flow values at the Clinton gage to other areas in the basin employs the generally-used empirical equation for area-discharge relations expressed by Dr. Chow (Reference 7) in the form: $Q=jA^m$. For the purpose of this study, (j) was made equal to the calculated flow at the gage and (A) equals the drainage area at the point of interest divided by the drainage area at the gage. The values for the exponent (m), or the slope of the area-discharge line, were verified as being the exponent (x) in the data from the regression analysis provided in Bulletin No. 45. These values are as follows: for the 10-year flood, m = 0.59; for the 50-year flood, m = 0.56; for the 100-year flood, m = 0.55; and for the 500-year flood, m = 0.51. Review of the values for "m" shows that they fall in the range of 0.5 to 1.0, which is accepted by Brater as the general condition that might be expected (Reference 8).

Using the general formula, the flood peak discharges for storms having a recurrence of 10-, 50-, 100-, and 500-years were calculated. These discharges were summarized in a Drainage Area-Discharge Curve, which was used in this study.

All of the readily apparent methods except the procedure described above appeared to provide excessive reduction to the 50-, 100-, and 500-year storms and little reduction to the 10-year storm. Since this is contrary to the conditions that may be expected in a basin with considerable retention, other approaches were rejected as viable solutions to the problem.

A study report prepared by Stafford (Reference 9) provided storm flow hydrographs from the flood of 1959. This storm produced a flood with a recurrence period of about 14 years and was plotted on the Drainage Area-Discharge curves for comparison. These plots produced a reasonable check on the storm routing through the Tuscarawas basin. Streams studied by this method are the Tuscarawas River, Pigeon Creek and its tributaries, and Wolf Creek.

Methodology and discharges were summarized in a report titled Hydrologic Calculations for the Tuscarawas River and Its Tributaries (Reference 10). Hydrology on the Cuyahoga River and the Little Cuyahoga River was done by development of a drainage area-discharge curve using straight line extrapolation of gage calculations in the study area. This method was reviewed by the Buffalo District COE and verbal concurrence of acceptability has been received. Hydrology on Tinkers Creek was provided by the USGS. The magnitude of the discharges for the different frequencies were determined primarily by methods of regional analysis outlined by Webber and Bartlett (Reference 4) and adjusted by previous studies and flood frequency techniques.

Late in September 1979, the study area was inundated by rainfall generated from the remains of Hurricane Frederic. Rainfall recorded over a 15-hour period on September 20 and 21 at the Akon reporting station amounted to 6.2 inches. Using Soil Conservation Service (SCS) tables, this was extrapolated to a storm of approximately 300-year recurrence.

Although gage data are not available at the date of publication of this study, evaluation of ground and vegetation conditions at the time of this storm indicates that the combined hydrologic event produced a flood in the range of 100- to 200-year recurrence.

Field observations made during the flood show that actual water-surface elevations generally agree with those calculated for use in this study.

Discharge data used to determine detailed flooding on Indian Creek were obtained from the City of Macedonia Flood Insurance Study (Reference 11). Likewise, data for Roosevelt Ditch, Springfield Lake Outlet, the Ohio and Erie Canal, and the Cuyahoga River were obtained from the City of Akron Flood Insurance Study (Reference 12). Data for Mud Brook were obtained from the City of Cuyahoga Falls Flood Insurance Study (Reference 13). Additional discharge data for Tinkers Creek and Brandywine Creek were obtained from the City of Twinsburg and Village of Hudson Flood Insurance Studies, respectively (References 14 and 15).

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA SQ MILES	PEAK DISCHARGES (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BRANDYWINE CREEK					
Brandywine Road	25.9	2,415	3,649	4,247	5,684
Upstream of Indian Creek	18.2	1,700	2,549	2,951	3,917
Downstream corporate limit of Boston Heights	13.1	1,387	2,098	2,436	3,248
Hines Hill Road	6.6	868	1,222	1,395	2,075
TINKERS CREEK					
East county boundary	20.5	1,450	2,200	2,575	3,400
TINKERS CREEK TRIBUTARY					
At mouth	4.8	423	607	688	875
PIGEON CREEK					
Norton corporate limit	24.8	741	1,102	1,264	1,731
Akron corporate limit	7.5	366	563	654	939
Cleveland-Massillon Road	3.6	237	373	437	646
PIGEON CREEK TRIBUTARY 2					
Norton corporate limit	2.3	181	289	340	513
WOLF CREEK					
At Barberton Reservoir	29.1	802	1,205	1,380	1,878
YELLOW CREEK					
Upstream of confluence with the Cuyahoga River	31.0	2,156	3,313	3,884	5,258
Upstream of confluence with North Branch Yellow Creek	13.1	1,537	2,355	2,754	3,711

TABLE 1 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA SQ MILES	PEAK DISCHARGES (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
INDIAN CREEK					
At mouth	5.78	780	1,195	1,391	1,864
At Conrail	3.73	546	838	974	1,302
Upstream of confluence of Tributary No. 3	1.72	323	501	585	787
MUD BROOK					
At State Route 8	24.81	1,322	1,852	2,081	2,625
NORTH BRANCH YELLOW CREEK					
Upstream of confluence with Yellow Creek	9.64	1,366	2,131	2,509	3,421
Upstream of confluence with North Branch Yellow Creek Tributary	5.77	930	1,458	1,717	2,343
NORTH BRANCH YELLOW CREEK TRIBUTARY					
At mouth	3.79	574	884	1,030	1,383
TUSCARAWAS RIVER (East)					
Clinton corporate line	164	2,260	3,173	3,573	4,537
River mile 15.76	34.3	1,669	2,519	2,914	3,759
Schrop Junior High School	30.5	1,524	2,310	2,696	3,468
Upstream Chessie System	25.8	1,311	2,001	2,326	3,039
Myersville Road	11.8	750	1,177	1,384	1,851
Canton Road	10.6	628	992	1,172	1,588
LITTLE CUYAHOGA RIVER					
At the downstream Akron corporate limit	26.9	500	700	800	1,050

TABLE 1 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA SQ MILES	PEAK DISCHARGES (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
SPRINGFIELD LAKE OUTLET					
At Little Cuyahoga Rive	10.7	254	403	472	642
At south corporate limit	6.8	186	297	348	476
CUYAHOGA RIVER					
At northern corporate line	474	6,163	7,954	8,850	10,786
At Bath Road	443	5,394	6,915	7,673	9,294
Downstream of Mud Brook	433	5,157	6,596	7,312	8,839
At Penninsula Road	404	4,499	5,714	6,317	7,588
WEST BRANCH ROOSEVELT DITCH					
At Roosevelt Ditch	0.3	149	225	259	338
OHIO AND ERIE CANAL					
At Akron-Barberton corporate line	3.8	501	760	875	1,204
At Manchester Road	3.1	420	640	740	1,030
At Waterloo Road	2.3	322	495	575	800

Cross sections for the backwater analyses of streams in the study area were obtained by field methods, including the below-water portion of the section. Bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry, except where information was supplied by the COE or the ODOT.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and are based on field observations or by photogrammetric evaluation of oblique aerial photographs of selected areas in the community (Reference 16). Values used for the Tuscarawas River were obtained from the COE. Roughness factors used in this study are summarized in the following table:

Roughness Values (Manning's "n")

Stream	Channel	Overbank
Brandywine Creek	0.013 to 0.03	0.015 to 0.07
Cuyahoga River	0.03 to 0.04	0.05 to 0.08
Pigeon Creek	0.03 to 0.039	0.06 to 0.07
Indian Creek	0.012 to 0.05	0.012 to 0.07
Piegeon Creek Tributary 2	0.012 to 0.03	0.07 to 0.10
Mud Brook	0.03	0.05
Tinkers Creek	0.03	0.06
West Branch Roosevelt Ditch	0.03 to 0.04	0.06 to 0.07
Wolf Creek	0.028 to 0.03	0.024 to 0.07
Ohio and Erie Canal	0.03	0.05 to 0.07
Yellow Creek	0.024 to 0.03	0.06
Springfield Lake Outlet	0.03 to 0.05	0.05 to 0.08
Tributaries to Yellow Creek	0.02 to 0.03	0.05
Little Cuyahoga River	0.03 to 0.042	0.045 to 0.09
Tuscarawas River	0.015 to 0.03	0.04 to 0.09

Starting water-surface elevations for all detailed studies with the exception of Pigeon Creek, the Little Cuyahoga River, the eastern portion of the Tuscarawas River, Wolf Creek, and Ohio and Erie Canal were calculated using the slope-area method incorporated in the HEC-2 program (Reference 17). Starting water elevations on the Tuscarawas River, Wolf Creek, and Ohio and Erie Canal were taken from rating curves developed for use with this study. Use of these rating curves and the computer program produced profiles with water-surface elevations consistent with historical data. Starting water-surface elevations for Pigeon Creek were taken from the contiguous Norton Flood Insurance Study (Reference 18). Starting water-surface elevations on the Little Cuyahoga River were developed by a headwater calculation at a culvert located at the downstream study limit.

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 17). Elevations used to determine detailed flooding on Indian Creek were obtained from the City of Macedonia Flood Insurance Study (Reference 11). Elevations for Roosevelt Ditch, Springfield Lake Outlet, the Ohio and Erie Canal, and the Cuyahoga River were obtained from the City of Akron Flood Insurance Study (Reference 12). Elevations for Mud Brook were obtained from the City of Cuyahoga Falls Flood Insurance Study (Reference 13). Additional elevations on Tinkers Creek and Brandywine Creek were obtained from the City of Twinsburg and Village of Hudson Flood Insurance Studies, respectively (References 14 and 15). Flood profiles were drawn showing computed water-surface elevations for floods of selected recurrence intervals (Exhibit 1).

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using topographic maps photoenlarged to a scale of 1:12000, with a contour interval of 10 feet, supplemented by field measurements (Reference 19). For the streams studied by approximate methods, the boundary of the 100-year flood was taken from the Flood Hazard Boundary Map (Reference 20).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

Floodway data in Summit County for Indian Creek were obtained from the City of Macedonia Flood Insurance Study (Reference 11). Floodway data for Roosevelt Ditch, Springfield Lake Outlet, and the Cuyahoga River were obtained from the City of Akron Flood Insurance Study (Reference 12). Floodway data for Mud Brook were obtained from the City of Cuyahoga Falls Flood Insurance Study (Reference 13). Additional floodway data for Brandywine Creek were obtained from the Village of Hudson Flood Insurance Study (Reference 15).

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2). Portions of the floodways of the Ohio Canal, Brandywine Creek, the Tuscarawas River, and the Cuyahoga River are outside of the county limits.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
TUSCARAWAS RIVER								
A	102.85	189	1345	2.7	951.1	951.1	951.9	0.8
B	102.88	129	1137	3.2	951.1	951.1	951.9	0.8
C	102.90	192	1700	2.1	951.2	951.2	952.1	0.9
D	102.93	221	1695	2.1	951.2	951.2	952.1	0.9
E	103.07	297	1809	2.0	951.3	951.3	952.2	0.9
F	103.28	404	2510	1.4	951.5	951.5	952.5	1.0
G	103.46	351	1780	2.0	951.6	951.6	952.6	1.0
H	103.59	458	2021	1.8	951.8	951.8	952.8	1.0
I	103.79	473	2308	1.5	952.1	952.1	953.1	1.0
J	103.96	422	2257	1.6	952.3	952.3	953.3	1.0
K	104.15	291	1601	2.2	952.5	952.5	953.5	1.0
L	104.30	391	2222	1.6	952.7	952.7	953.7	1.0
M	104.48	84	968	3.7	952.8	952.8	953.8	1.0
N	104.57	79	827	4.3	953.1	953.1	954.1	1.0
O	104.64	97	874	4.1	954.1	954.1	954.9	0.8
P	104.75	116	1124	3.2	954.5	954.5	955.2	0.7
Q	104.86	119	1055	3.4	954.8	954.8	955.4	0.6
R	104.93	170	1448	2.5	955.1	955.1	956.0	0.9
S	105.02	131	1105	3.2	955.2	955.2	956.1	0.9
T	105.16	145	1217	2.9	955.7	955.7	956.7	1.0
U	105.22	218	1634	2.2	955.9	955.9	956.9	1.0
V	105.26	78	891	4.0	955.9	955.9	956.9	1.0
W	105.27	113	1069	3.3	956.0	956.0	957.0	1.0
X	105.35	76	725	4.9	956.2	956.2	957.1	0.9
Y	105.44	116	1222	2.9	956.7	956.7	957.5	0.8
Z	105.58	94	1037	3.4	957.0	957.0	957.8	0.8

[1]MILES ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

TUSCARAWAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
TUSCARAWAS RIVER								
AA	105.73	164	1370	2.6	957.5	957.5	958.2	0.7
AB	105.90	114	1157	3.1	957.9	957.9	958.5	0.6
AC	106.04	121	1158	3.0	958.2	958.2	958.8	0.6
AD	106.20	99	832	4.2	958.7	958.7	959.1	0.4
AE	106.28	152	1302	2.7	959.1	959.1	959.5	0.4
AF	106.35	103	971	3.6	959.2	959.2	959.6	0.4
AG	106.39	98	973	3.6	959.3	959.3	959.7	0.4
AH	106.43	133	1039	3.4	959.6	959.6	959.9	0.3
AI	106.61	115	1099	3.2	960.0	960.0	960.4	0.4
AJ	115.76	200	775	3.8	998.5	998.5	999.5	1.0
AK	115.99	180	954	3.1	1001.1	1001.1	1002.0	0.9
AL	116.85	170	1239	2.4	1008.9	1008.9	1009.2	0.3
AM	117.70	150	657	4.1	1025.1	1025.1	1025.5	0.4
AN	118.11	150	676	4.0	1031.2	1031.2	1032.1	0.9
AO	118.67	55	327	8.2	1042.3	1042.3	1042.7	0.4
AP	118.92	300	1729	1.6	1052.7	1052.7	1052.7	0.0
AQ	119.73	145	525	5.1	1054.1	1054.1	1054.7	0.6
AR	119.99	100	732	3.2	1057.2	1057.2	1057.7	0.5
AS	120.34	26	115	12.0	1062.7	1062.7	1062.7	0.0
AT	120.39	167	1356	1.0	1075.2	1075.2	1075.7	0.5
AU	120.87	125	851	1.6	1077.8	1077.8	1078.7	0.9
AV	121.14	60	225	6.2	1078.8	1078.8	1079.4	0.6
AW	121.36	260	1891	0.7	1088.1	1088.1	1088.1	0.0
AX	121.55	50	224	6.2	1088.1	1088.1	1088.1	0.0
AY	121.72	340	2391	0.6	1100.2	1100.2	1100.2	0.0
AZ	122.35	110	394	3.0	1105.6	1105.6	1106.1	0.5
BA	122.39	35	245	4.8	1107.7	1107.7	1108.0	0.3

[1]MILES ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

TUSCARAWAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
CUYAHOGA RIVER								
A	0	131[4]	1252	7.1	731.5	731.5	731.5	0.0
B	9635	126[4]	1467	5.0	741.5	741.5	742.2	0.7
C	17,465	140[4]	1471	5.0	744.2	744.2	745.0	0.8
D	18,630	105[4]	888	7.1	744.8	744.8	745.6	0.8
E	19,480	87[4]	497	12.7	746.2	746.2	746.5	0.3
LITTLE CUYAHOGA RIVER								
A	8.910[2]	26	114	7.0	1032.6	1032.6	1033.6	1.0
B	8.940[2]	30	147	5.4	1033.7	1033.7	1034.3	0.6
C	8.963[2]	26	128	6.2	1034.7	1034.7	1034.7	0.0
D	9.250[2]	28	162	4.9	1036.9	1036.9	1037.8	0.9
E	9.500[2]	29	163	4.9	1039.0	1039.0	1039.5	0.5
F	9.730[2]	31	138	5.8	1041.2	1041.2	1041.5	0.3
G	9.920[2]	105	267	3.0	1043.0	1043.0	1043.0	0.0
H	9.970[2]	105	357	2.2	1043.5	1043.5	1044.0	0.5
I	10.100[2]	34	143	5.6	1044.0	1044.0	1045.0	1.0
BRANDYWINE CREEK								
A	10,800[3]	90	552	7.7	834.2	834.2	834.2	0.0
B	18,545[3]	125	345	12.3	921.4	921.4	922.1	0.7
C	20,550[3]	68	389	10.9	962.5	962.5	962.5	0.0
D	21,000[3]	97[5]	798	5.3	965.5	965.5	965.8	0.3
E	22,890[3]	295[5]	2036	1.4	966.4	966.4	967.4	1.0
F	27,780[3]	50	497	5.9	968.7	968.7	969.5	0.8
G	37,780[3]	50	319	4.4	980.4	980.4	981.1	0.7
H	43,050[3]	34	204	6.8	983.0	983.0	983.6	0.6
I	55,080[3]	91[6]	373	2.3	1031.4	1031.4	1032.0	0.6

[1]FEET ABOVE DOWNSTREAM CORPORATE LIMITS OF CITY OF AKRON
[2]MILES ABOVE MOUTH
[3]FEET ABOVE MOUTH
[4]THIS WIDTH EXTENDS WITHIN CITY OF AKRON
[5]THIS WIDTH EXTENDS WITHIN CITY OF MACEDONIA
[6]THIS WIDTH EXTENDS WITHIN VILLAGE OF HUDSON

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

CUYAHOGA RIVER - LITTLE CUYAHOGA RIVER - BRANDYWINE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
TINKERS CREEK								
A	75,480	457	1982	1.3	1001.8	1001.8	1002.8	1.0
B	76,749	55	341	7.5	1002.8	1002.8	1003.4	0.6
C	76,980	128	810	3.2	1004.3	1004.3	1004.9	0.6
D	78,355	179	1019	2.5	1005.1	1005.1	1005.7	0.6
E	81,717	260	1391	1.9	1006.7	1006.7	1007.3	0.6
TINKERS CREEK TRIBUTARY								
A	2736	30	174	4.0	1015.9	1015.9	1016.1	0.2
B	3557	22	100	6.9	1015.9	1015.9	1016.6	0.7
C	4854	120	330	2.1	1019.2	1019.2	1019.8	0.6

[1]FEET ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

TINKERS CREEK - TINKERS CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
YELLOW CREEK								
A	832	100	1888	2.1	750.9	750.9	750.9	0.0
B	4157	48	281	13.8	757.8	757.8	757.8	0.0
C	8407	100	346	11.2	797.7	797.7	798.5	0.8
D	9518	52	255	15.2	804.0	804.0	804.2	0.2
E	9679	52	171	22.7	806.8	806.8	806.8	0.0
F	10,206	55	294	13.2	828.2	828.2	828.2	0.0
G	10,786	61	306	12.7	834.3	834.3	834.3	0.0
H	13,957	71	518	7.5	851.9	851.9	851.9	0.0
I	15,486	45	310	12.5	857.3	857.3	857.3	0.0
J	16,638	74	511	7.6	864.3	864.3	865.0	0.7
K	18,187	94	449	8.7	872.7	872.7	872.9	0.2
L	18,251	139	983	4.0	874.3	874.3	875.3	1.0
M	20,780	30	265	14.7	885.4	885.4	885.7	0.3
N	22,166	23	219	17.7	892.5	892.5	893.0	0.5
O	24,626	74	326	11.9	906.0	906.0	906.0	0.0
P	25,212	26	186	14.8	912.2	912.2	912.6	0.4
Q	26,660	154	362	11.5	926.0	926.0	926.0	0.0
R	28,286	90	659	4.2	944.5	944.5	945.4	0.9
S	28,869	87	319	8.6	947.1	947.1	947.1	0.0
T	30,109	39	103	26.7	951.7	951.7	951.7	0.0
U	30,920	36	270	10.2	973.2	973.2	973.6	0.4
V	31,952	78	457	6.0	976.5	976.5	977.2	0.7
W	34,258	159	917	3.0	988.3	988.3	988.9	0.6
X	34,842	70	637	4.3	990.7	990.7	991.1	0.4

[1]FEET ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

YELLOW CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
NORTH BRANCH YELLOW CREEK								
A	191	48	212	11.8	912.2	911.2[3]	911.2	0.0
B	1691	74	277	9.1	923.5	923.5	923.5	0.0
C	2131	47	183	9.4	923.8	923.8	923.8	0.0
D	2343	49	186	9.3	926.0	926.0	926.0	0.0
E	4843	48	157	11.0	943.9	943.9	943.9	0.0
NORTH BRANCH YELLOW CREEK TRIBUTARY								
A	1400[2]	34	110	9.4	944.5	944.5	945.1	0.6
B	3900[2]	19	53	19.6	963.5	963.5	963.7	0.2
C	4552[2]	27	65	15.9	977.2	977.2	977.2	0.0

[1]FEET ABOVE CONFLUENCE WITH YELLOW CREEK
[2]FEET ABOVE CONFLUENCE WITH NORTH BRANCH YELLOW CREEK
[3]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM YELLOW CREEK

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

NORTH BRANCH YELLOW CREEK -
NORTH BRANCH YELLOW CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
PIGEON CREEK								
A	5000	64	404	3.1	969.5	967.4[2]	967.9	0.5
B	9249	187	1066	1.2	970.5	970.5	971.0	0.5
C	11,548	187	1303	1.0	971.1	971.1	971.7	0.6
D	16,900	28	191	3.4	972.0	972.0	973.0	1.0
E	21,288	22	177	3.7	979.0	979.0	979.2	0.2
F	25,577	16	133	4.9	981.8	981.8	982.6	0.8
G	29,556	54	199	3.3	992.0	992.0	992.7	0.7
H	33,387	79	136	4.8	1000.5	1000.5	1001.1	0.6
I	36,038	68	265	2.5	1021.8	1021.8	1022.6	0.8
J	43,155	94	118	3.7	1034.1	1034.1	1034.6	0.5
K	46,663	290	1682	0.3	1045.1	1045.1	1046.1	1.0
PIGEON CREEK TRIBUTARY NO. 2								
A	3730	160	568	0.6	969.5	966.0[2]	967.0	1.0
B	8380	30	148	2.3	969.5	966.9[2]	967.7	0.8
C	8965	22	90	3.8	971.2	971.2	971.2	0.0
D	10,323	28	103	3.2	973.3	973.3	973.3	0.0
E	14,670	40	80	4.2	995.5	995.5	995.5	0.0
F	16,080	45	102	3.3	1019.4	1019.4	1019.4	0.0
G	16,230	60	269	1.3	1024.4	1024.4	1024.4	0.0

[1]FEET ABOVE MOUTH
[2]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM WOLF CREEK

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

PIGEON CREEK - PIGEON CREEK TRIBUTARY NO. 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
WOLF CREEK								
A	33,000	495	1587	0.9	999.5	999.5	1000.5	1.0
B	34,418	280	858	1.6	1000.1	1000.1	1000.8	0.7
C	38,288	100	357	3.9	1002.9	1002.9	1003.0	0.1
D	41,788	39	230	6.0	1007.3	1007.3	1007.8	0.5
E	43,488	41	302	4.6	1009.5	1009.5	1010.1	0.6
SPRINGFIELD LAKE OUTLET								
A	15,293	80[2]	209	1.7	1070.9	1070.9	1071.9	1.0

[1]FEET ABOVE MOUTH
[2]THIS WIDTH EXTENDS WITHIN CITY OF AKRON

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

WOLF CREEK - SPRINGFIELD LAKE OUTLET

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 10.

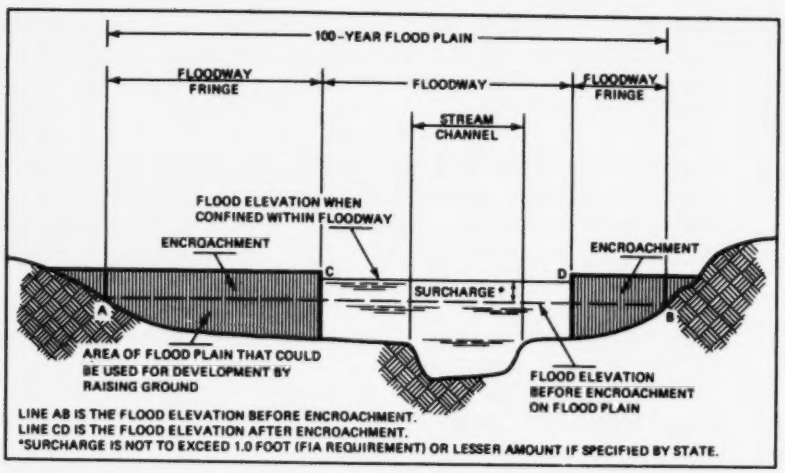
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 10 - Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the unincorporated areas of Summit County.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the unincorporated areas of Summit County are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire unincorporated areas of Summit County were divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.

Zones A1-A5, A11: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.

Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year

flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the unincorporated areas of Summit County is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

Flood Insurance Studies for the adjacent communities of Macedonia, Akron, Cuyahoga Falls, Hudson, Norton, Barberton, Tallmadge, Magadore, Fairlawn, Boston Heights, Brecksville, Walton Hills, Valley View, Glenwillow, and Solon are in complete agreement with this study (References 11-13, 15, 18, 21-30).

A Flood Plain Information (FPI) Report was prepared for the Cuyahoga River by the Buffalo District COE (Reference 31).

Differences occurred between the flood elevations and discharges used in this study and the Cuyahoga River FPI Report. Review of calculations indicates that this difference is due to the extended period of record and improved calculation procedures used for Flood Insurance Studies. Verbal concurrence with this reason was received from the Buffalo District COE.

A contiguous Flood Insurance Study is being prepared for adjacent Stark County; however, this study has not progressed to a point where a comparison of dishcarges and profiles could be made (Reference 32).

A FPI Report was prepared for the Tuscarawas River by the Huntington District COE (Reference 33). Significant disagreement exists in regard to the discharges and flood elevations presented in the FPI Report and this study. In January 1979, a dissertation summarizing the hydrology of the upper Tuscarawas basin was prepared by Dalton-Dalton-and Newport (Reference 10) and forwarded for review and comment to the Huntington District COE, the USGS, the ODNR, and the FIA.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
TUSCARAWAS RIVER							
REACH 1	0110,0130,0135	–2.2	–0.5	1.4	020	A4	VARIES–SEE MAP
REACH 2	0110	–2.2	–0.5	1.4	020	A4	VARIES–SEE MAP
REACH 3	0045	–1.0	–0.3	0.6	010	A2	VARIES–SEE MAP
REACH 4	0035,0045	–1.9	–0.5	0.8	020	A4	VARIES–SEE MAP
REACH 5	0035,0045,0055	–1.4	–0.4	0.8	015	A3	VARIES–SEE MAP
REACH 6	0055	–0.9	–0.3	0.5	010	A2	VARIES–SEE MAP
REACH 7	0055	–1.7	–0.7	1.3	015	A3	VARIES–SEE MAP
REACH 8	0055	–1.1	–0.3	0.7	010	A2	VARIES–SEE MAP
CUYAHOGA RIVER							
REACH 1[4]	0105	–1.7	–0.5	1.0	015	A3	VARIES–SEE MAP
REACH 2[4]	0040	–1.7	–0.5	1.0	015	A3	VARIES–SEE MAP
LITTLE CUYAHOGA RIVER							
REACH 1	0035	–1.1	–0.3	0.8	010	A2	VARIES–SEE MAP
BRANDYWINE CREEK							
REACH 1	0015	–1.1	–0.5	1.3	010	A2	VARIES–SEE MAP
REACH 2	0010,0015,0020	–2.1	–0.5	0.7	020	A4	VARIES–SEE MAP
REACH 3[5]	0010	–1.1	–0.3	1.5	010	A2	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT
[4]DATA FOR THIS REACH TAKEN FROM CITY OF AKRON, OHIO FIS
[5]DATA FOR THIS REACH TAKEN FROM VILLAGE OF HUDSON, OHIO FIS

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

TUSCARAWAS RIVER - CUYAHOGA RIVER - LITTLE CUYAHOGA RIVER - BRANDYWINE CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
TINKERS CREEK							
REACH 1[4]	0005	–1.5	–0.4	0.9	015	A3	VARIES–SEE MAP
REACH 2	0005,0010	–1.5	–0.5	0.9	015	A3	VARIES–SEE MAP
TINKERS CREEK TRIBUTARY							
REACH 1	0010	–0.7	–0.2	0.4	005	A1	VARIES–SEE MAP
YELLOW CREEK							
REACH 1	0105	–1.9	–0.5	0.6	020	A4	VARIES–SEE MAP
REACH 2	0105	–2.3	–0.6	0.8	025	A5	VARIES–SEE MAP
REACH 3	0105	–1.7	–0.5	0.5	015	A3	VARIES–SEE MAP
NORTH BRANCH YELLOW CREEK							
REACH 1	0105	–1.4	–0.4	0.9	015	A3	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT
[4]DATA FOR THIS REACH TAKEN FROM CITY OF TWINSBURG, OHIO FIS

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

TINKERS CREEK - TINKERS CREEK TRIBUTARY - YELLOW CREEK - NORTH BRANCH YELLOW CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
NORTH BRANCH YELLOW CREEK TRIBUTARY							
REACH 1	0105	–0.9	–0.3	0.6	010	A2	VARIES–SEE MAP
PIGEON CREEK							
REACH 1	0110	–1.9	–0.6	1.3	020	A4	VARIES–SEE MAP
REACH 2	0105	–2.0	–0.6	1.0	020	A4	VARIES–SEE MAP
REACH 3	0105	–0.7	–0.2	0.6	005	A1	VARIES–SEE MAP
REACH 4	0105	–2.0	–0.3	0.6	020	A4	VARIES–SEE MAP
REACH 5	0105,0115	–1.5	–0.4	1.1	015	A3	VARIES–SEE MAP
REACH 6	0115	–0.8	–0.2	0.5	010	A2	VARIES–SEE MAP
REACH 7	0115	–1.4	–0.4	0.6	015	A3	VARIES–SEE MAP
PIGEON CREEK TRIBUTARY NO. 2							
REACH 1	0105,0110	–1.3	–0.4	1.1	015	A3	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

NORTH BRANCH YELLOW CREEK TRIBUTARY - PIGEON CREEK - PIGEON CREEK TRIBUTARY NO. 2

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
WOLF CREEK							
REACH 1	0115	–0.9	–0.3	0.6	010	A2	VARIES–SEE MAP
REACH 2	0115	–1.5	–0.4	1.0	015	A3	VARIES–SEE MAP
INDIAN CREEK							
REACH 1[4]	0015	–0.7	–0.2	0.4	005	A1	VARIES–SEE MAP
MUD BROOK							
REACH 1[5]	0040	–1.2	–0.4	0.7	010	A2	VARIES–SEE MAP
WEST BRANCH ROOSEVELT DITCH							
REACH 1[6]	0035	–5.7	–0.4	0.7	055	A11	VARIES–SEE MAP
REACH 2[6]	0035	–2.6	–0.5	0.7	025	A5	VARIES–SEE MAP
OHIO AND ERIE CANAL							
REACH 1[6]	0045,0110	–1.6	–0.5	1.3	015	A3	VARIES–SEE MAP
SPRINGFIELD LAKE OUTLET							
REACH 1[6]	0035	–1.0	–0.3	0.6	010	A2	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT
[4]DATA FOR THIS REACH TAKEN FROM CITY OF MACEDONIA, OHIO FIS
[5]DATA FOR THIS REACH TAKEN FROM CITY OF CUYAHOGA FALLS, OHIO FIS
[6]DATA FOR THIS REACH TAKEN FROM CITY OF AKRON, OHIO FIS

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

WOLF CREEK - INDIAN CREEK - MUD BROOK - WEST BRANCH ROOSEVELT DITCH - OHIO AND ERIE CANAL - SPRINGFIELD LAKE OUTLET

In reply, the COE acknowledged that the hydrology for the FPI Report was based on a regional analysis which may have unduly influenced the upper Tuscarawas basin. They further acknowledged that the FPI Report was based on expected probability calculations which raise flood flows in all cases. The COE declined further comment pending completion of a revised FPI Report which is expected in two years. At that time they will consider the previously mentioned dissertation in their revised hydrology and hydraulics.

The USGS agrees with the hydrology in the dissertation (used in this study), and further commented that the discharges presented herein should meet all FIA requirements. The USGS could provide no comment on the profiles other than the stage records at the Clinton gage which were used in this study.

Based on the fact that all hydrologic calculations contained in this study conform to U.S. Water Resources Council requirements, supported by USGS agreement, and that expected probability calculations do not meet FIA criteria, this contractor, with FIA concurrence, performed this study using the discharges and profiles presented herein. It should be further noted that the profiles are supported by stage readings obtained from the gage at Clinton.

A previous Flood Insurance Study was performed for the adjacent community of Stow (Reference 34). Flooding conditions in Stow and Summit County have no relation to each other.

A concurrent Flood Insurance Study was performed for the City of Twinsburg (Reference 14). Streams common to Summit County and Twinsburg were taken from that study.

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 20). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, One North Dearborn Street, Chicago, Illinois 60602.

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25. ————————, Flood Insurance Study, Boston Heights, Ohio, (in progress).

26. ————————, Flood Insurance Study, Brecksville, Ohio, (in progress).

27. ————————, Flood Insurance Study, Walton Hills, Ohio, (in progress).

28. ————————, Flood Insurance Study, Valley View, Ohio, (in progress).

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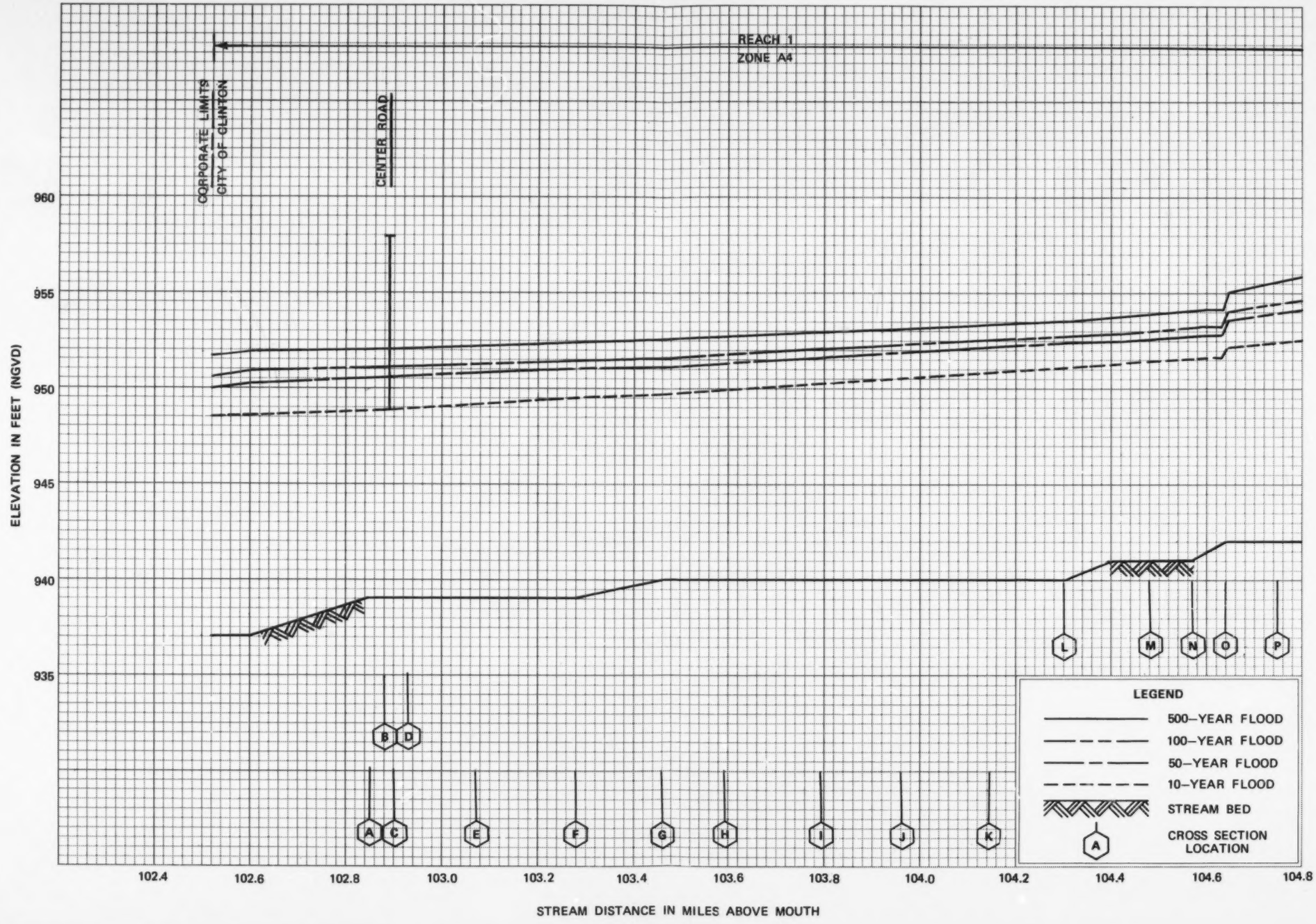


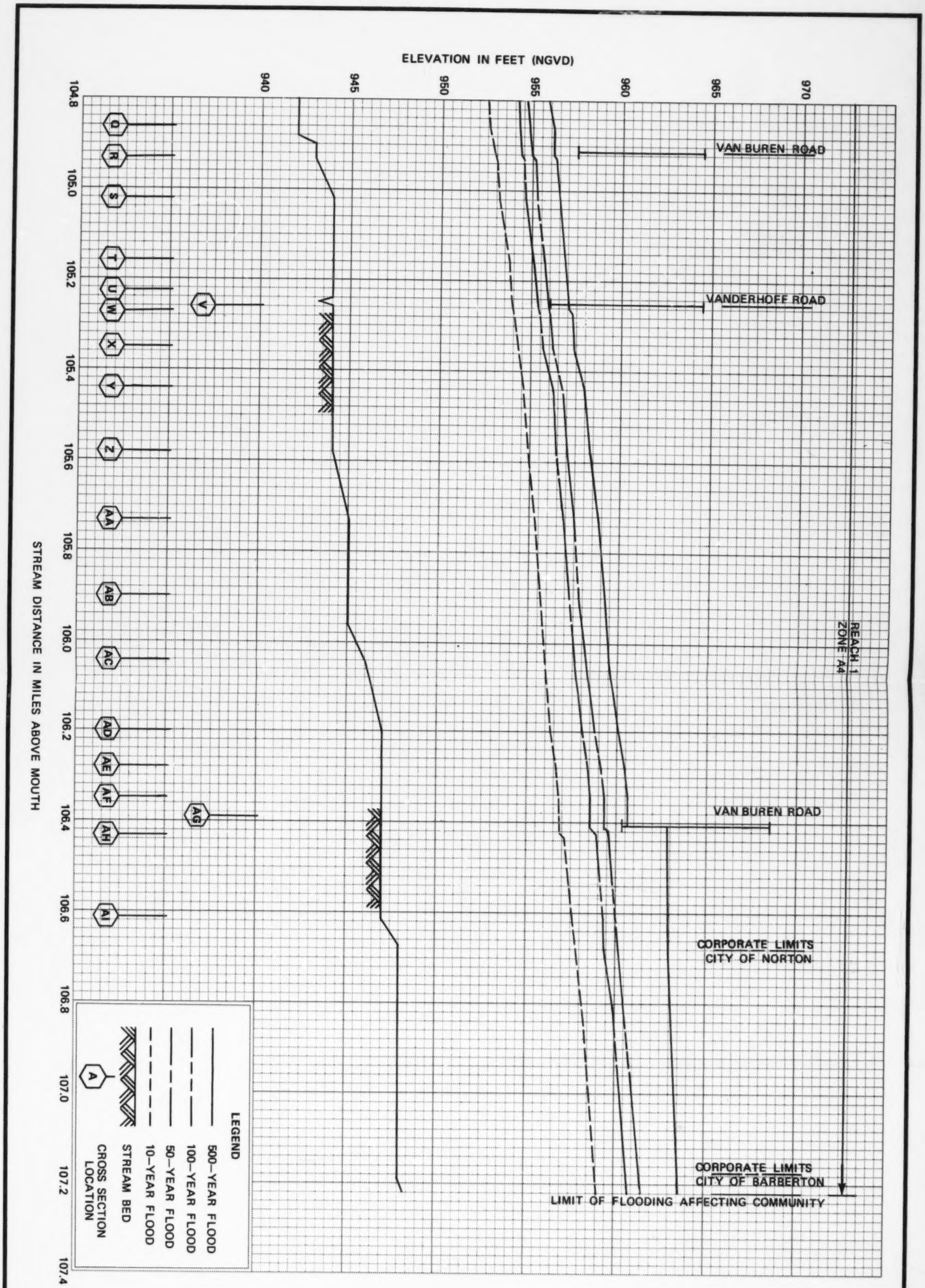
FLOOD PROFILES

TUSCARAWAS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

01P



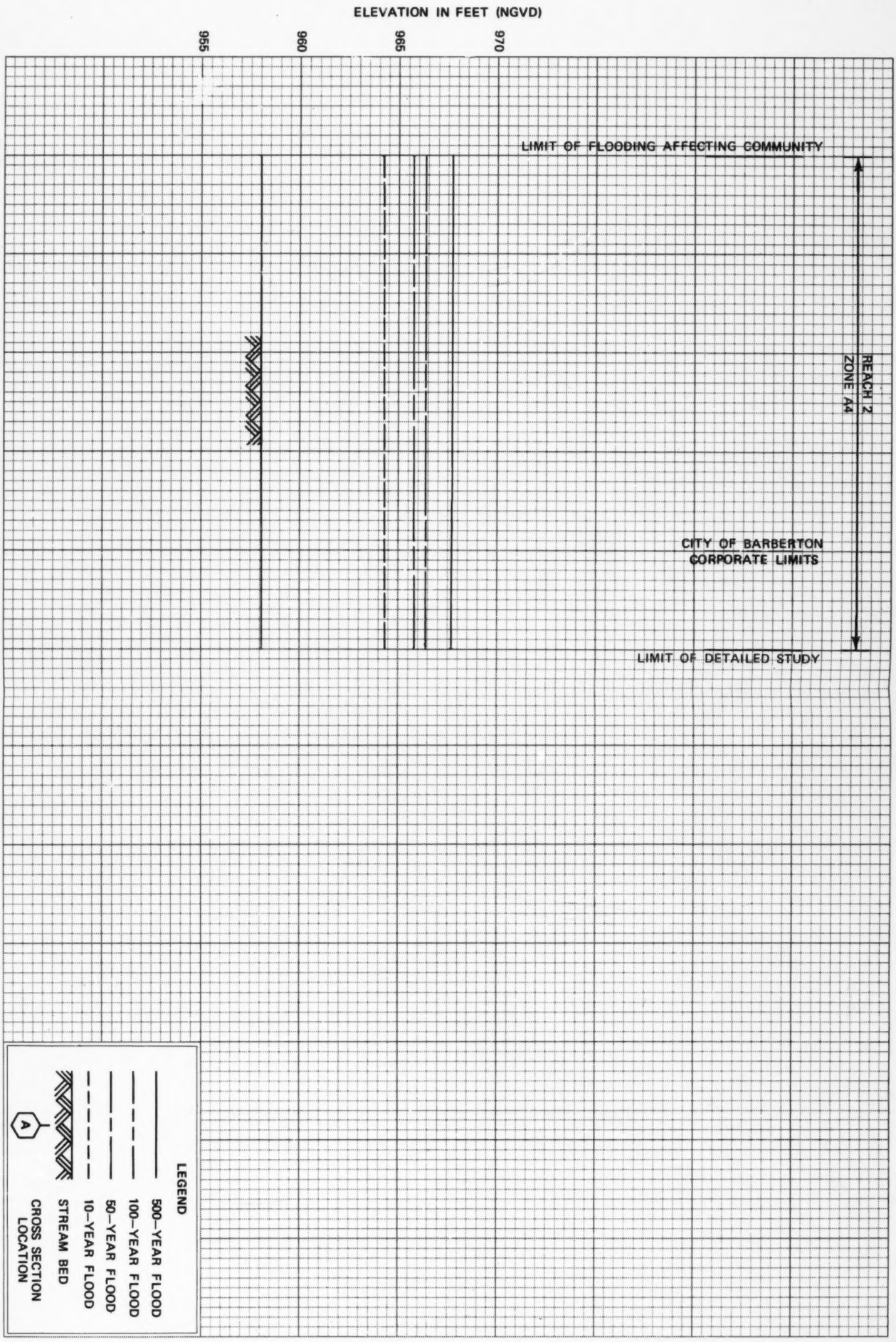
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

TUSCARAWAS RIVER



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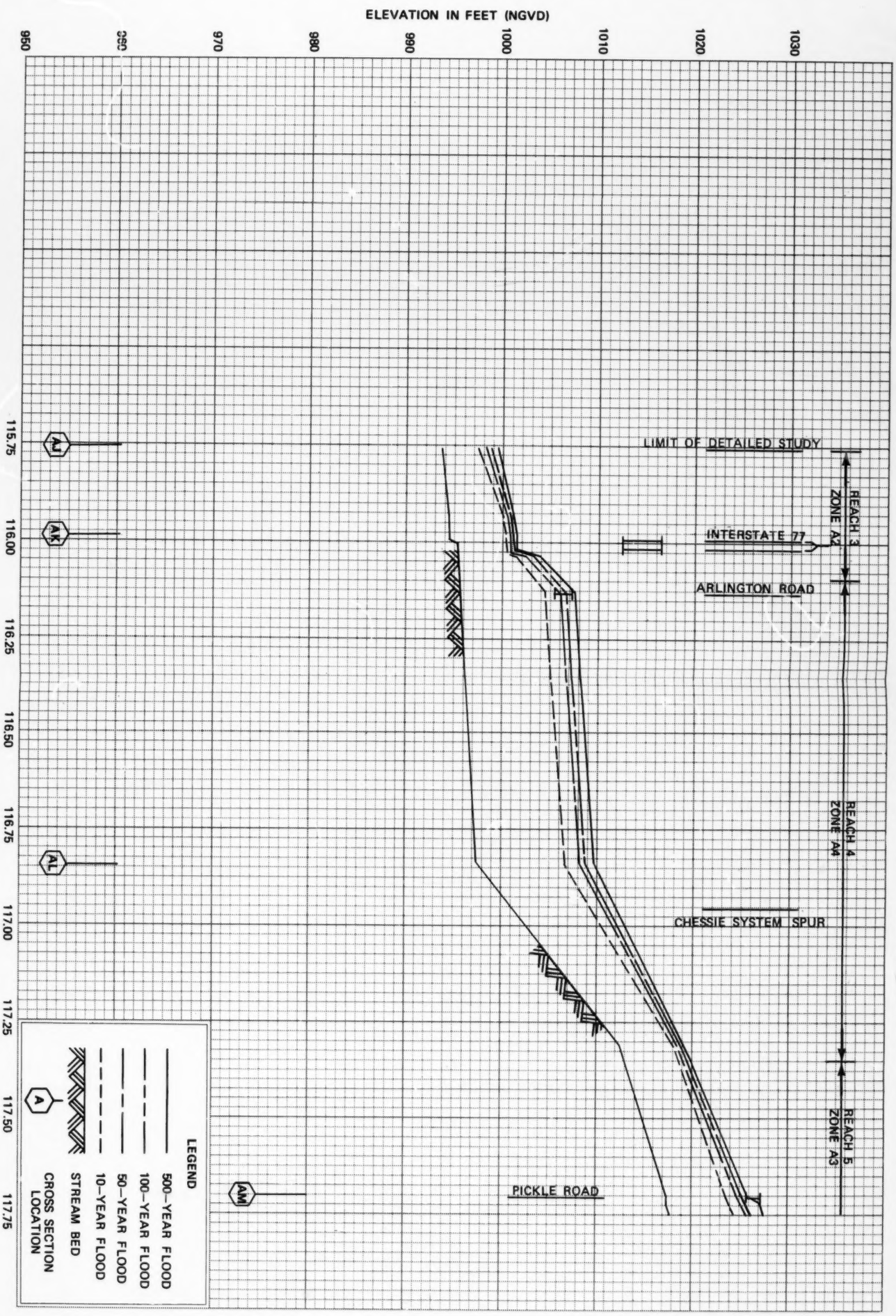
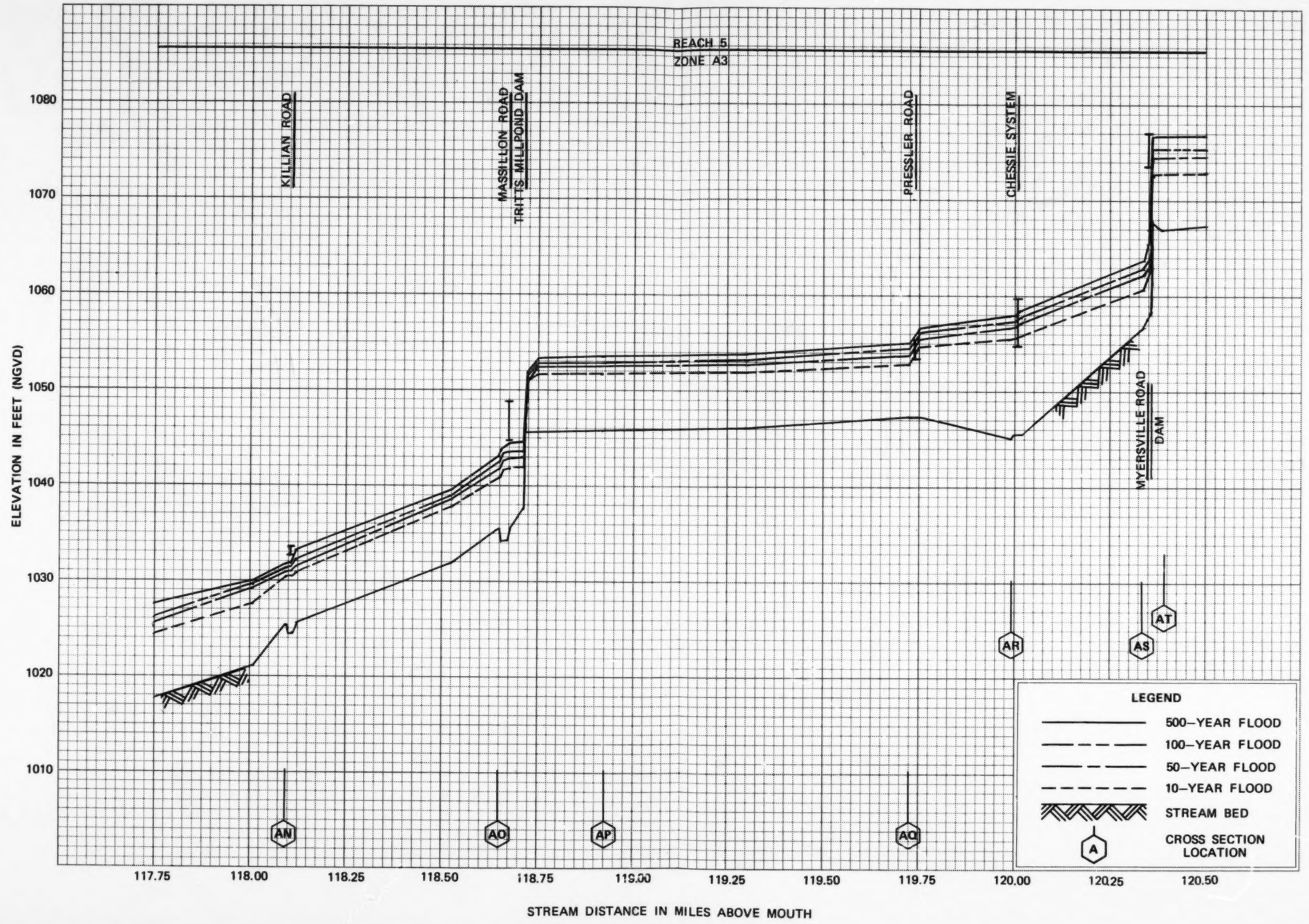


04P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

TUSCARAWAS RIVER



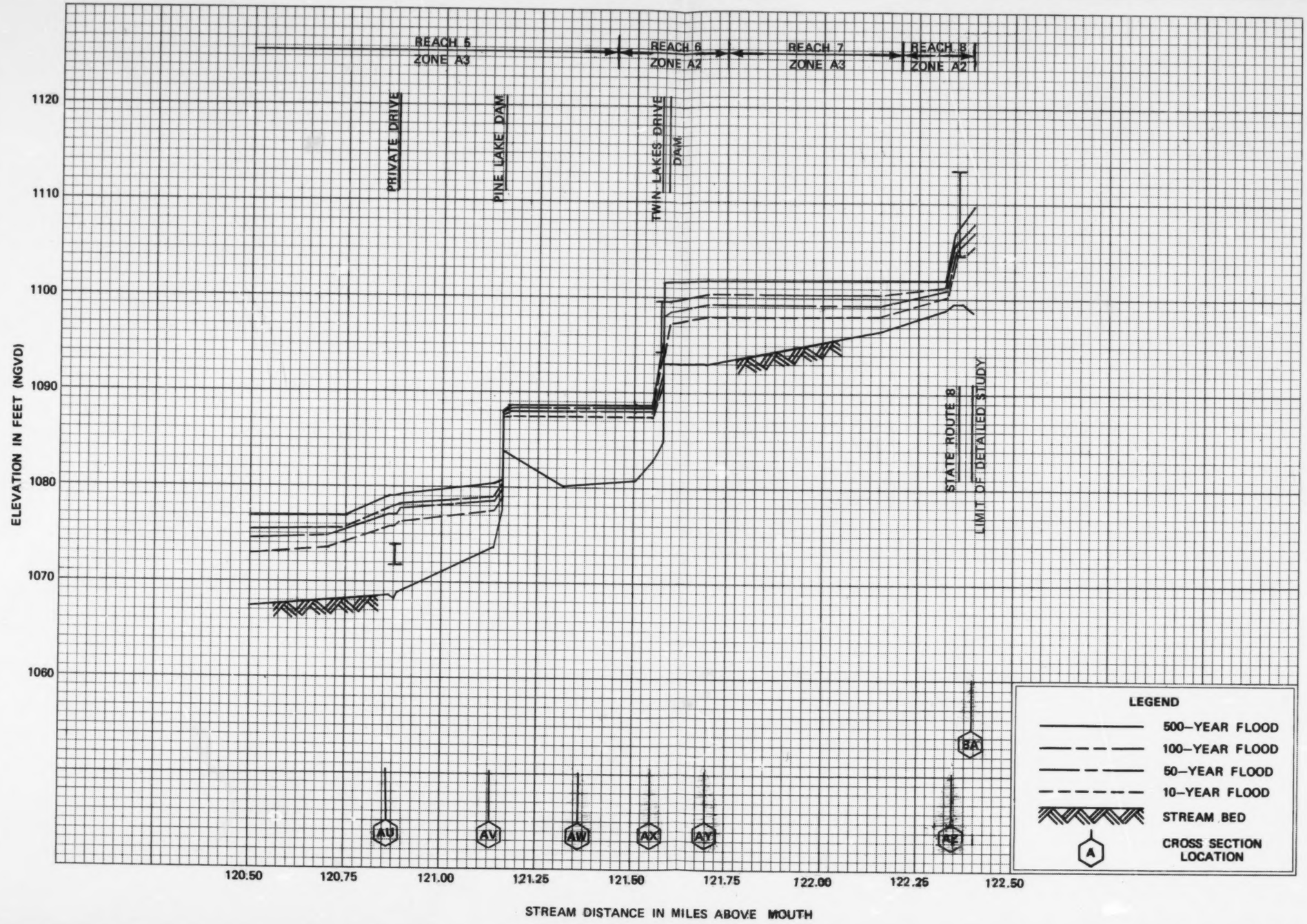
FLOOD PROFILES

TUSCARAWAS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

05P



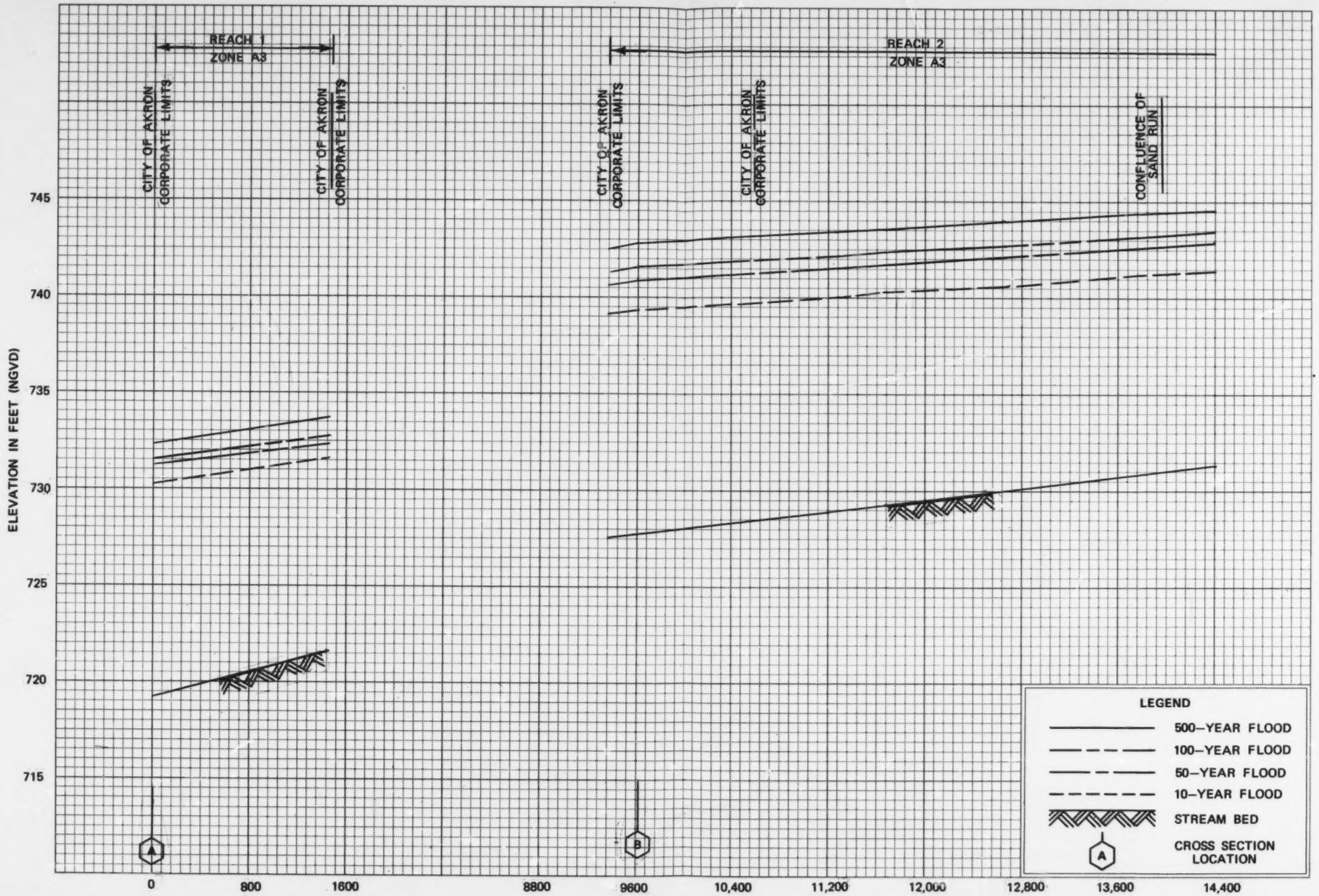
FLOOD PROFILES

TUSCARAWAS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

06P



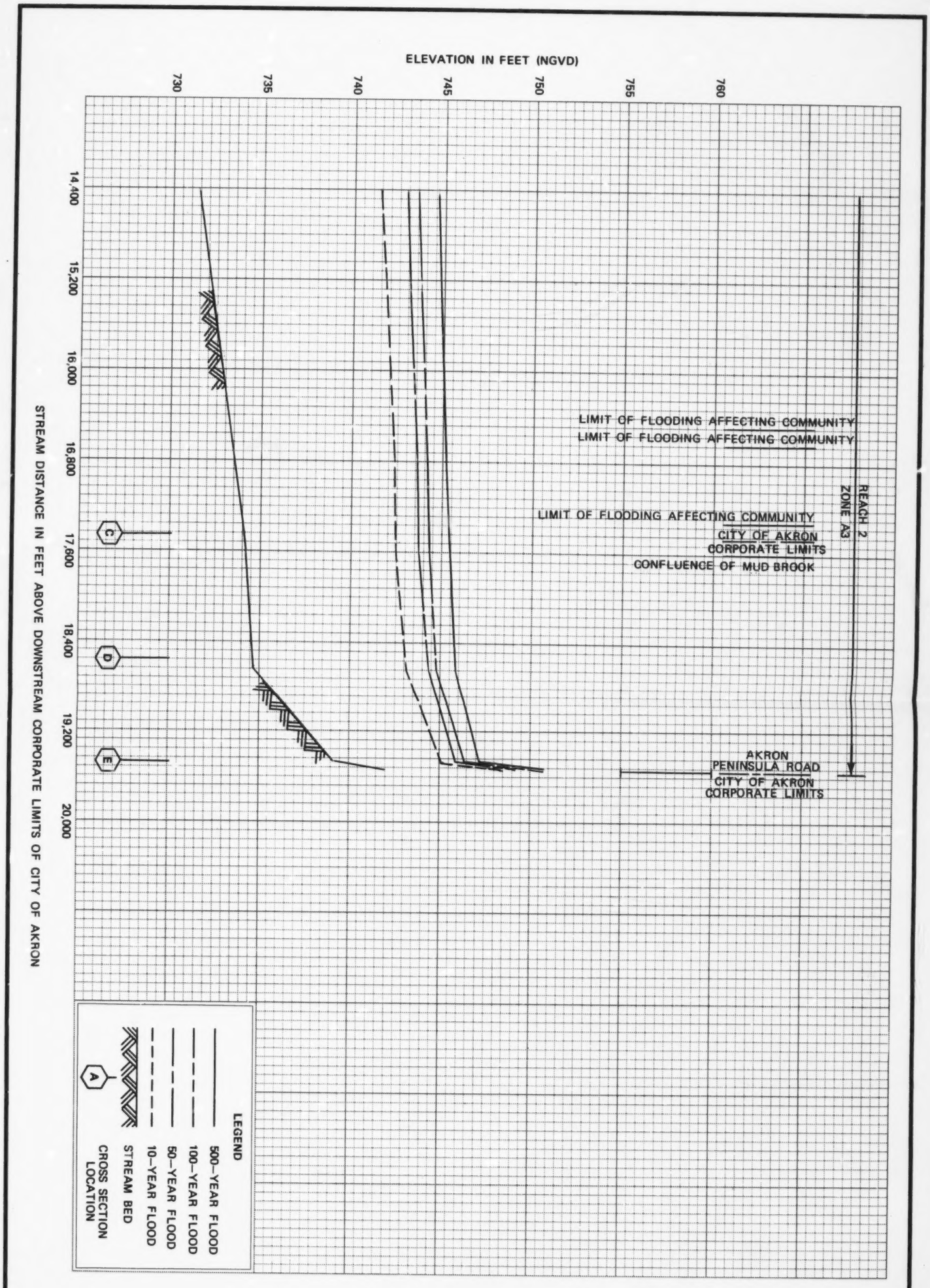
FLOOD PROFILES

CUYAHOGA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

07P

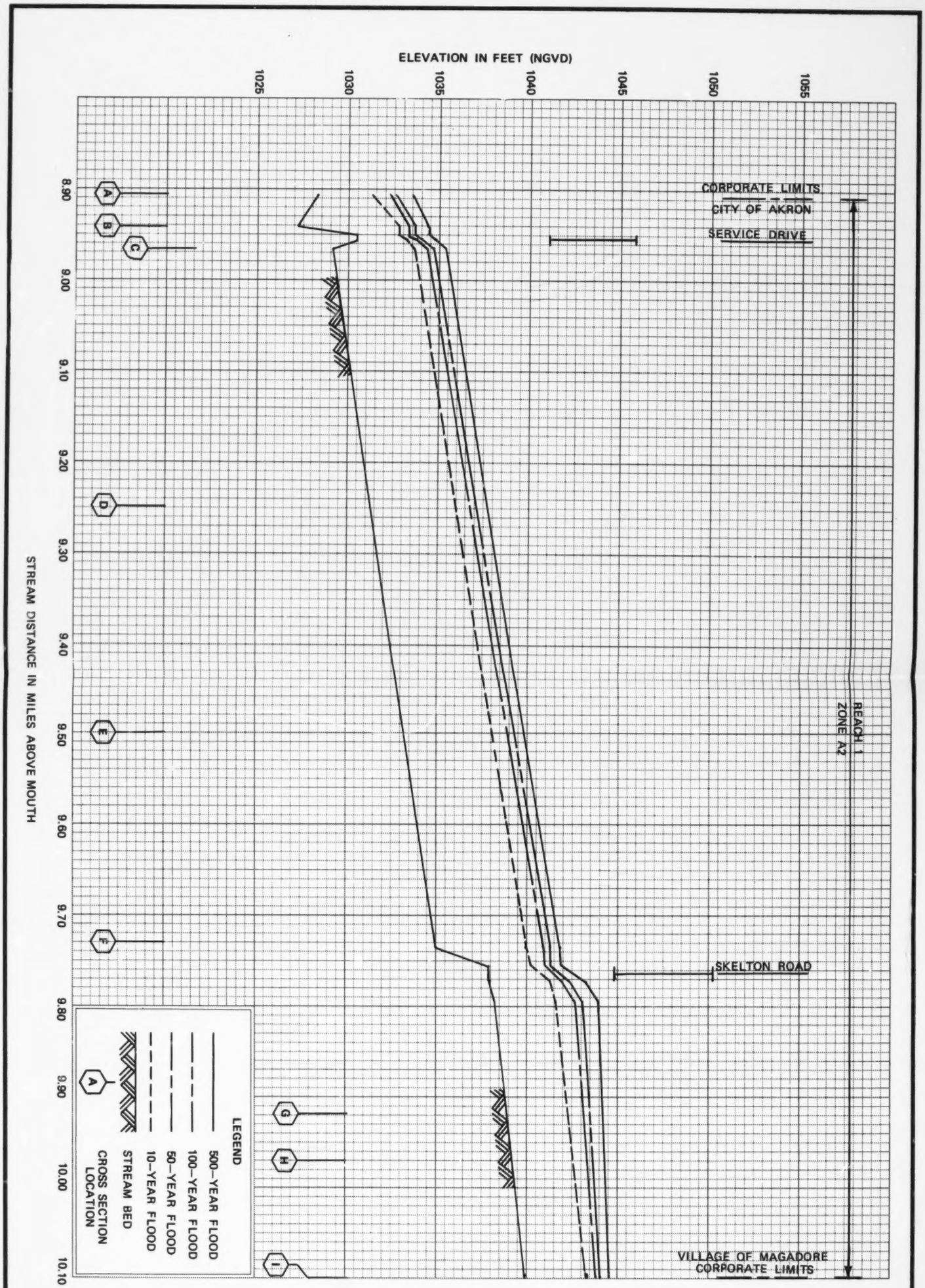


08P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

CUYAHOGA RIVER



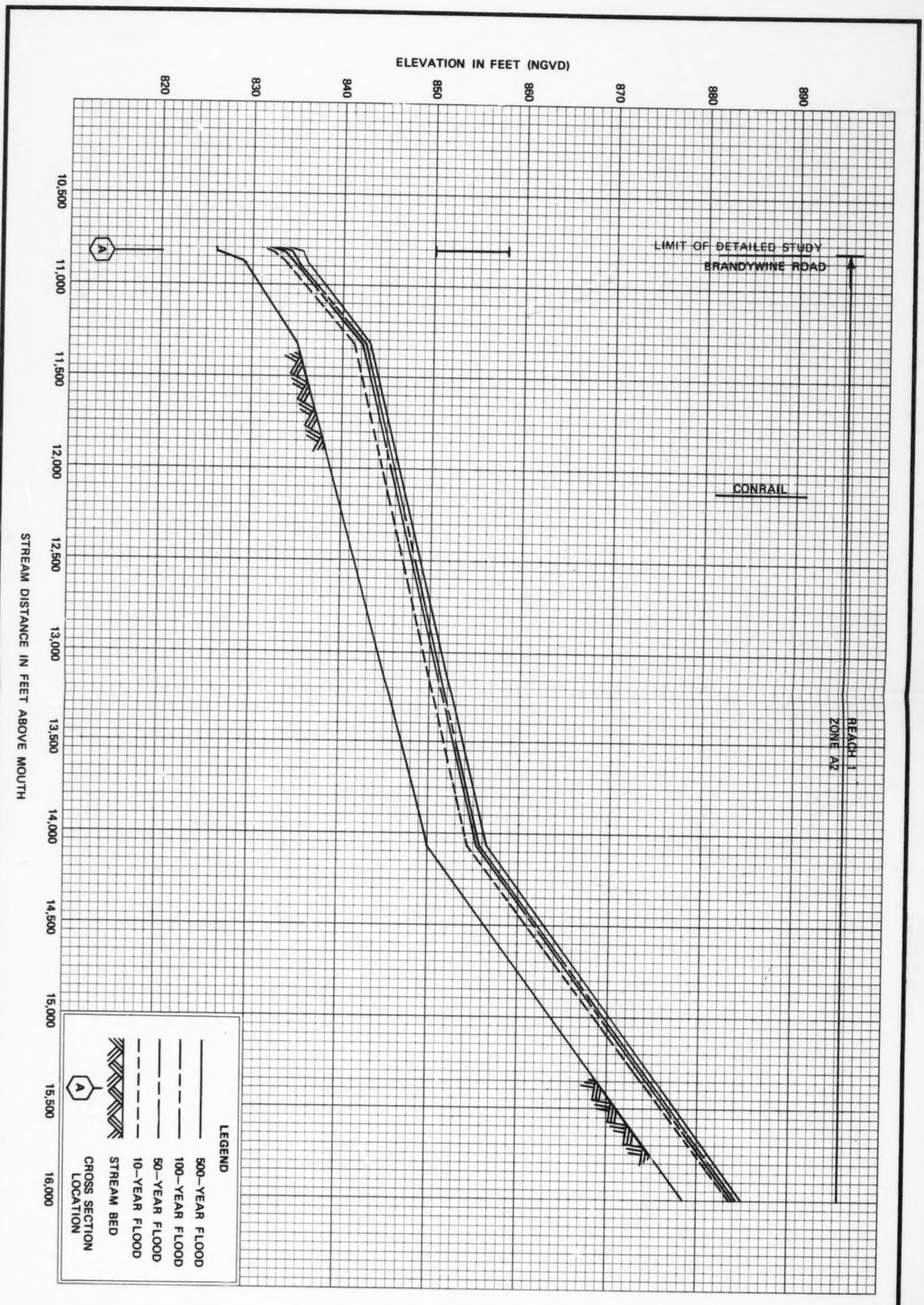
09P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

LITTLE CUYAHOGA RIVER

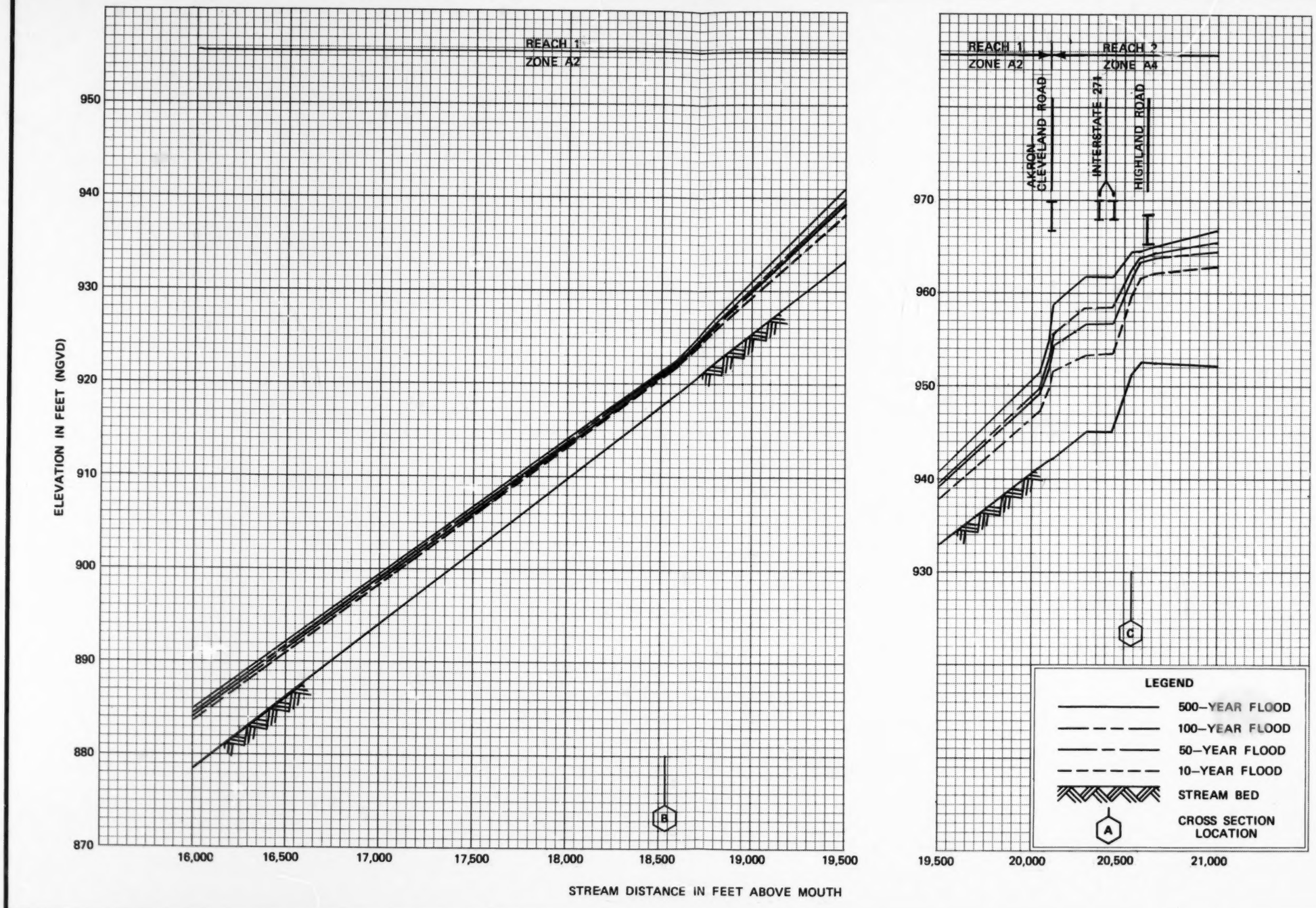


10P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

BRANDYWINE CREEK



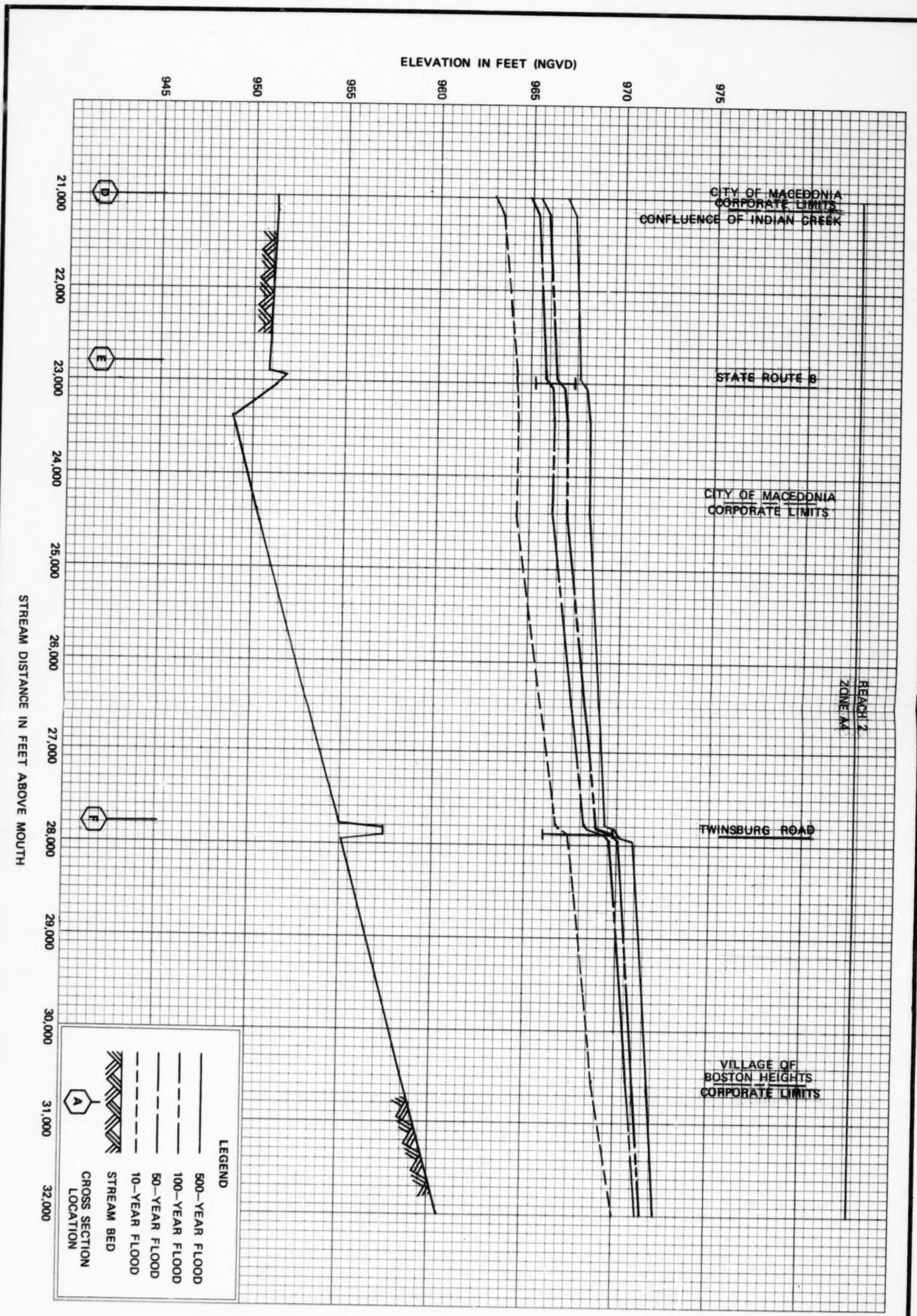
FLOOD PROFILES

BRANDYWINE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

11P

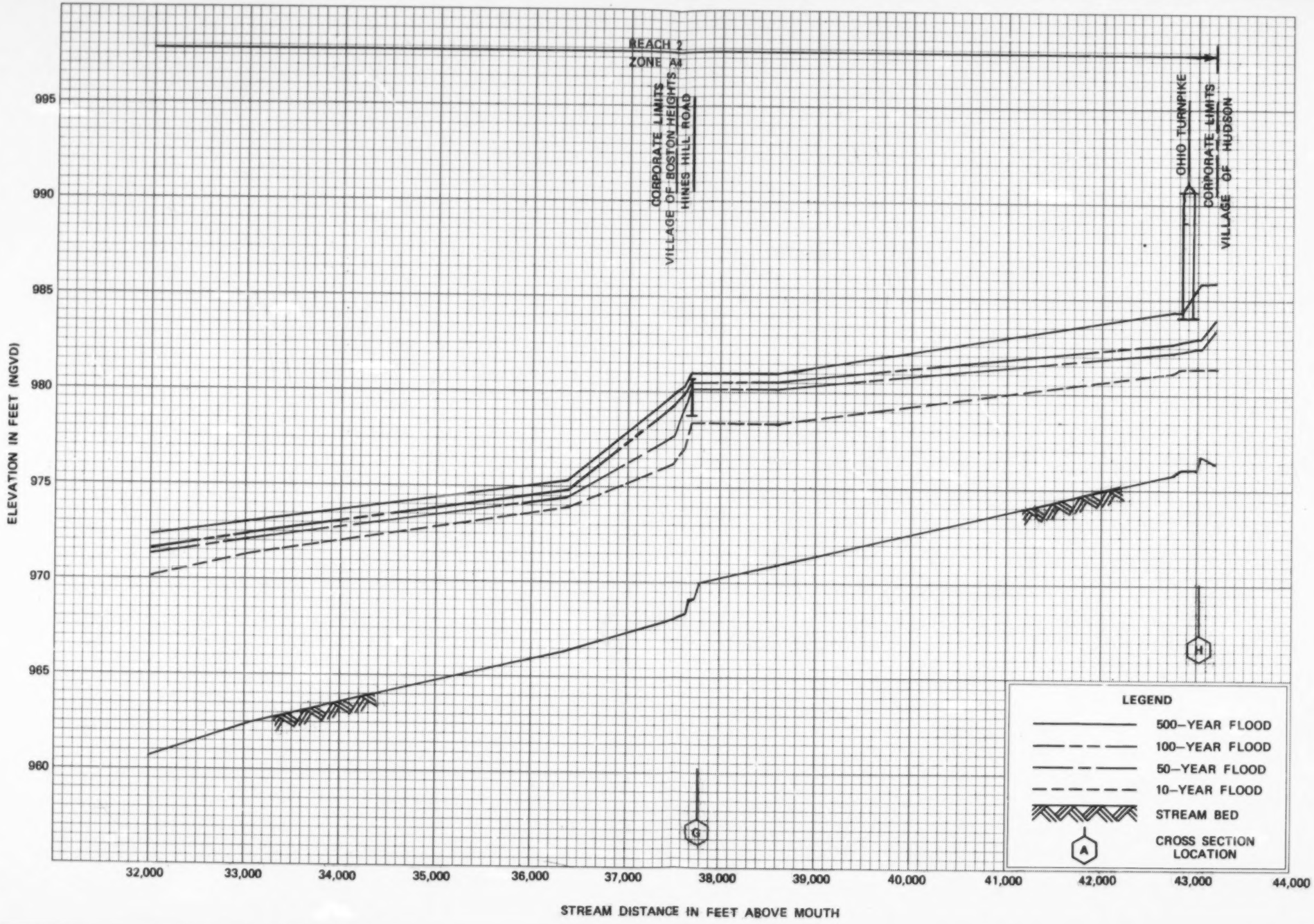


12P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

BRANDYWINE CREEK



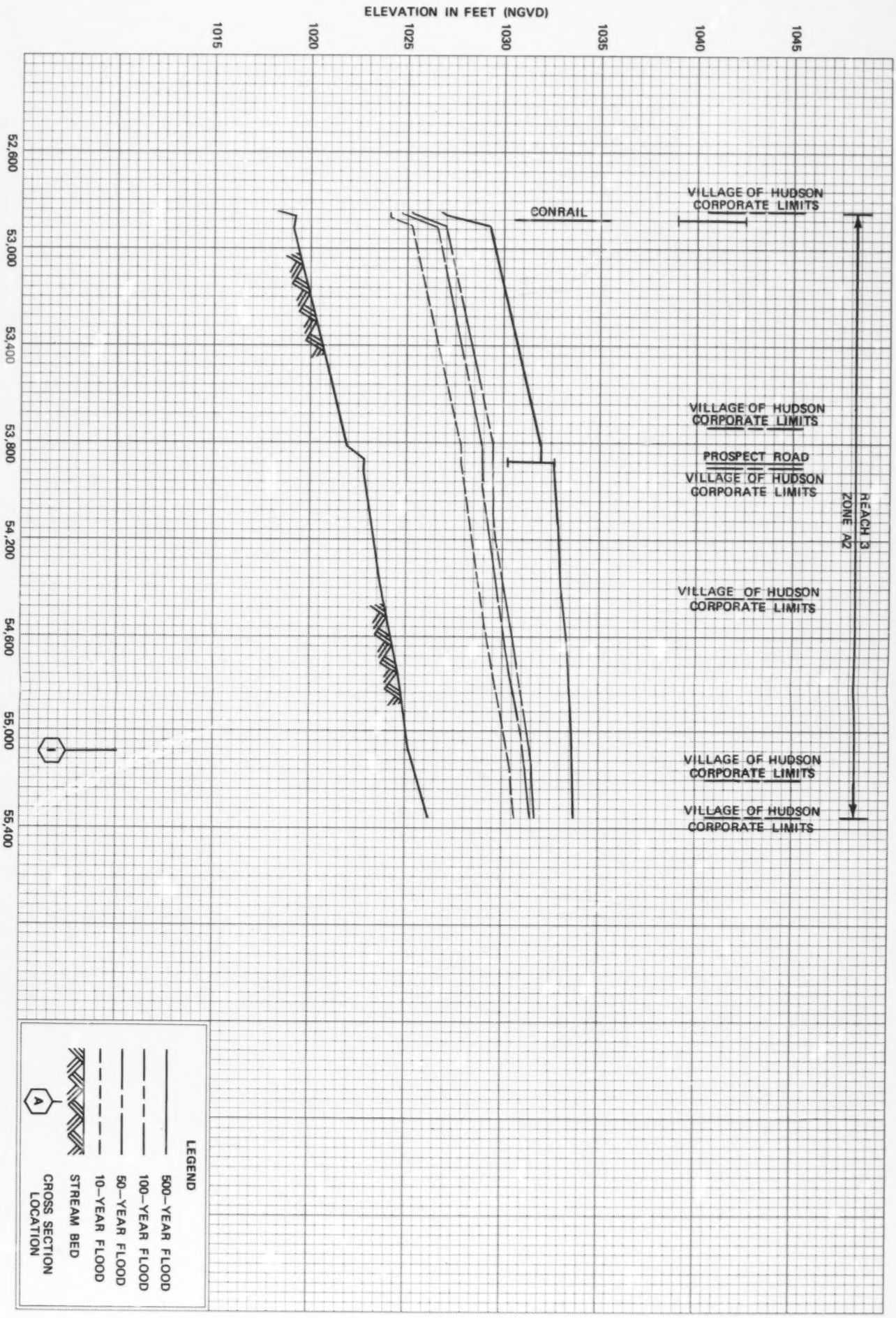
FLOOD PROFILES

BRANDYWINE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

13P

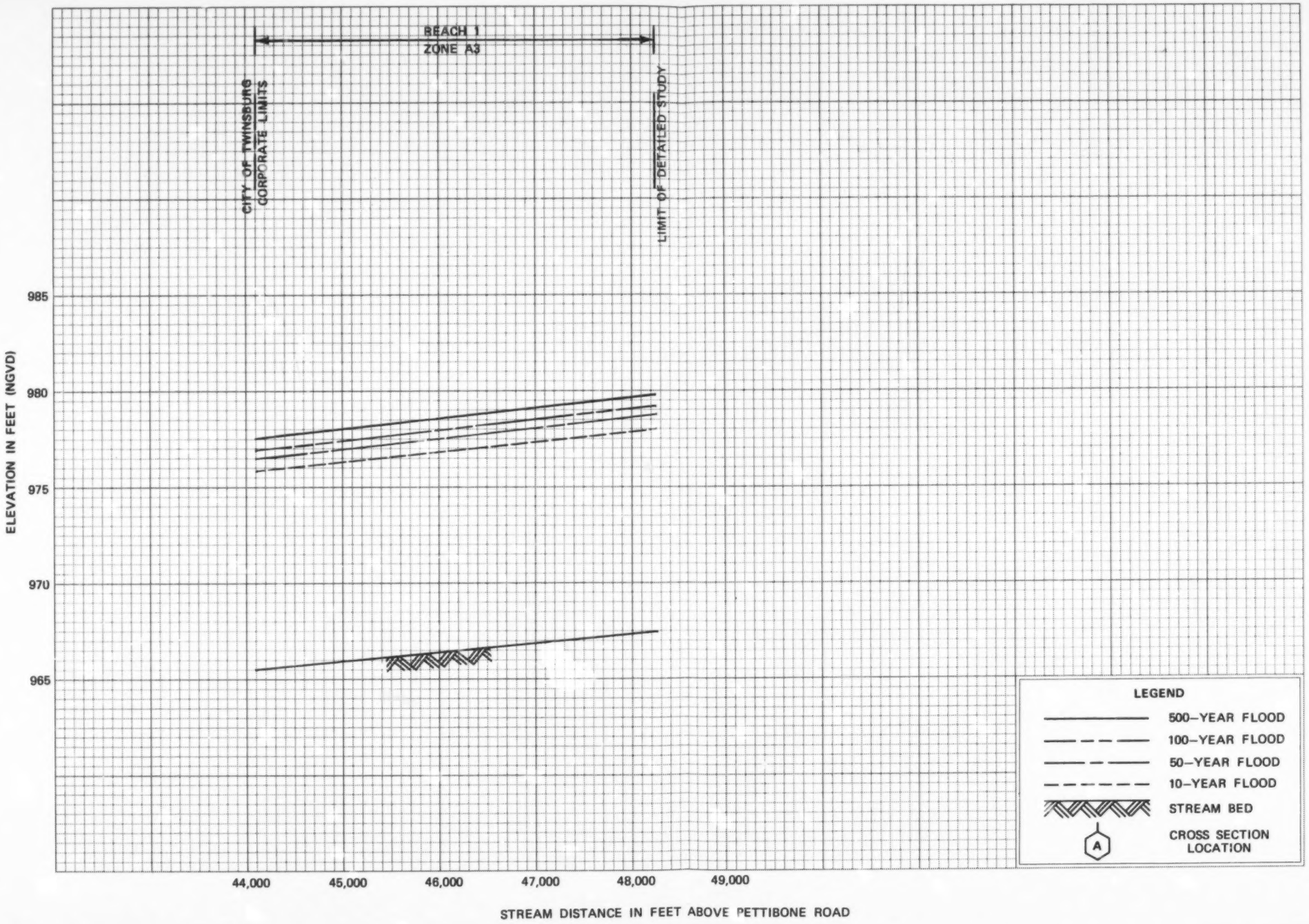


14P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

BRANDYWINE CREEK



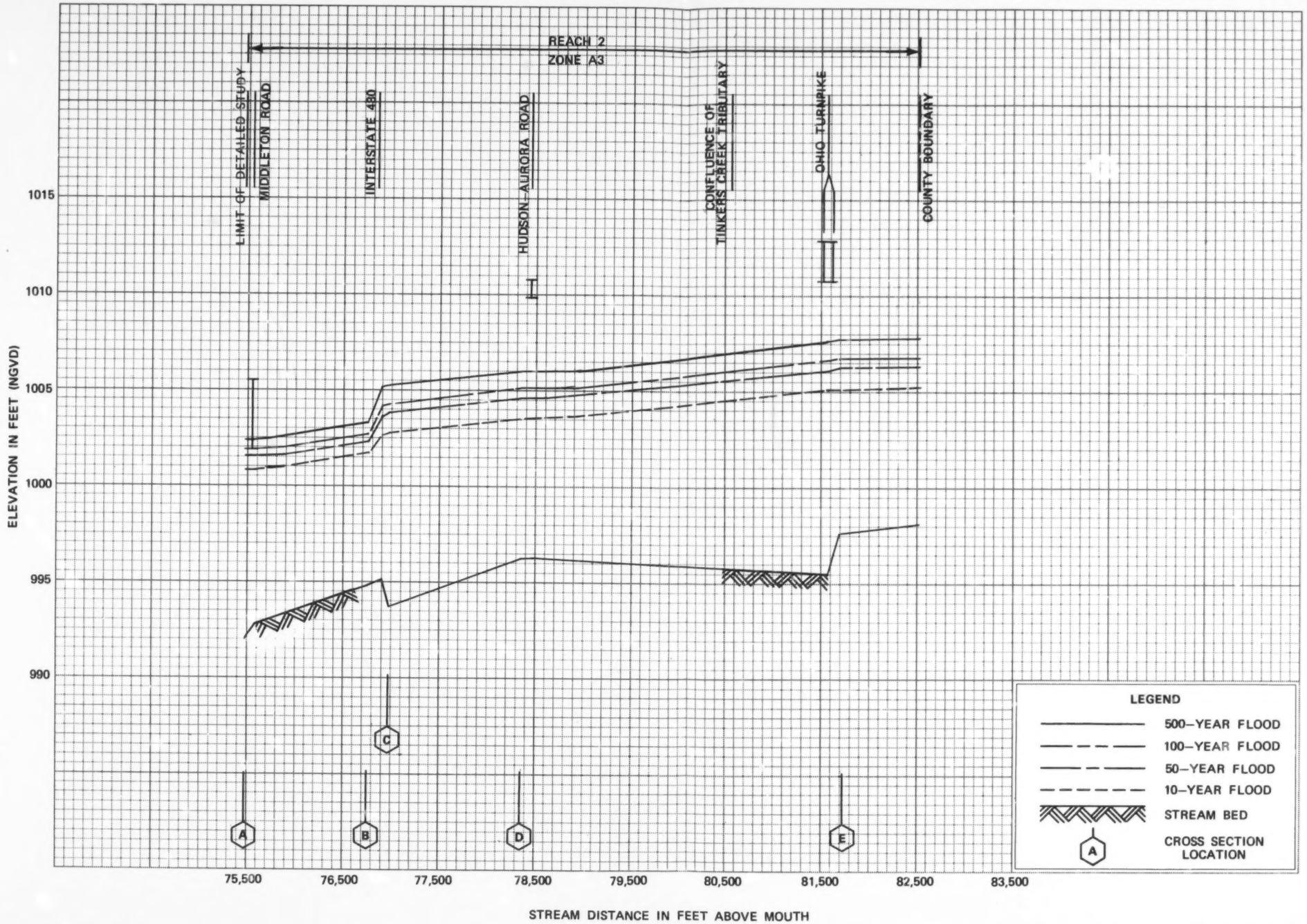
FLOOD PROFILES

TINKERS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

15P

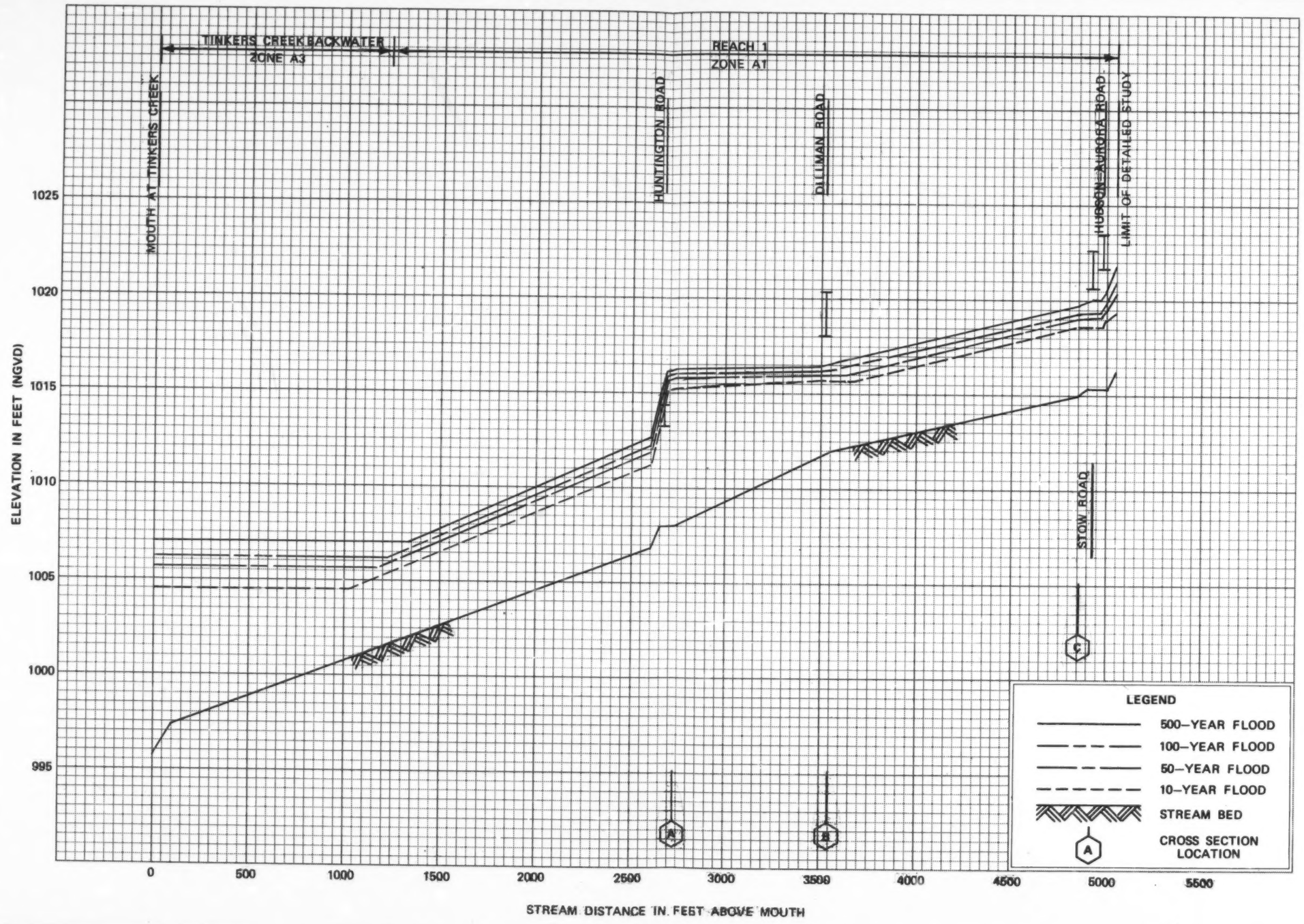


FLOOD PROFILES

TINKERS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

16P

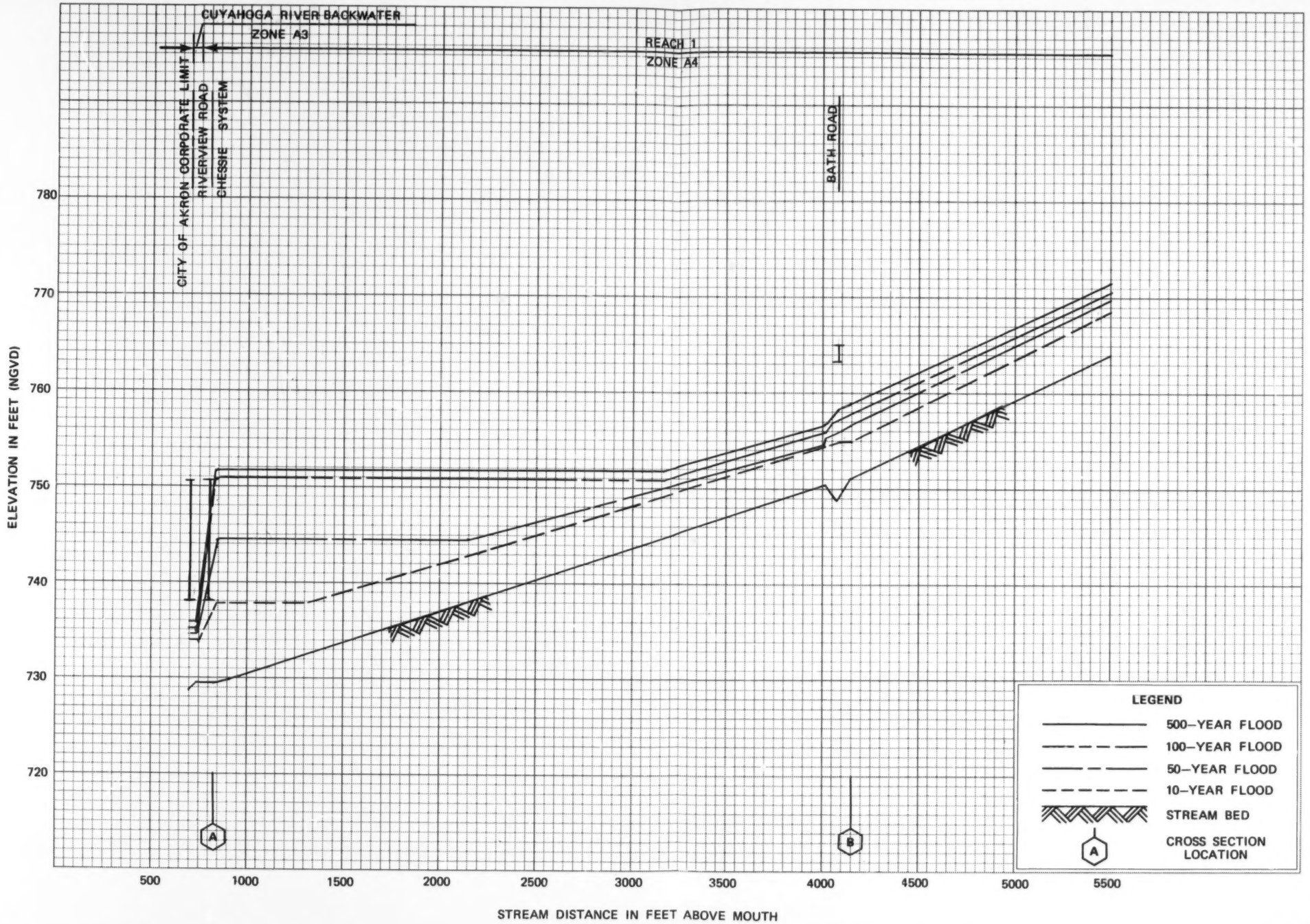


FLOOD PROFILES

TINKERS CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREA.)

17P

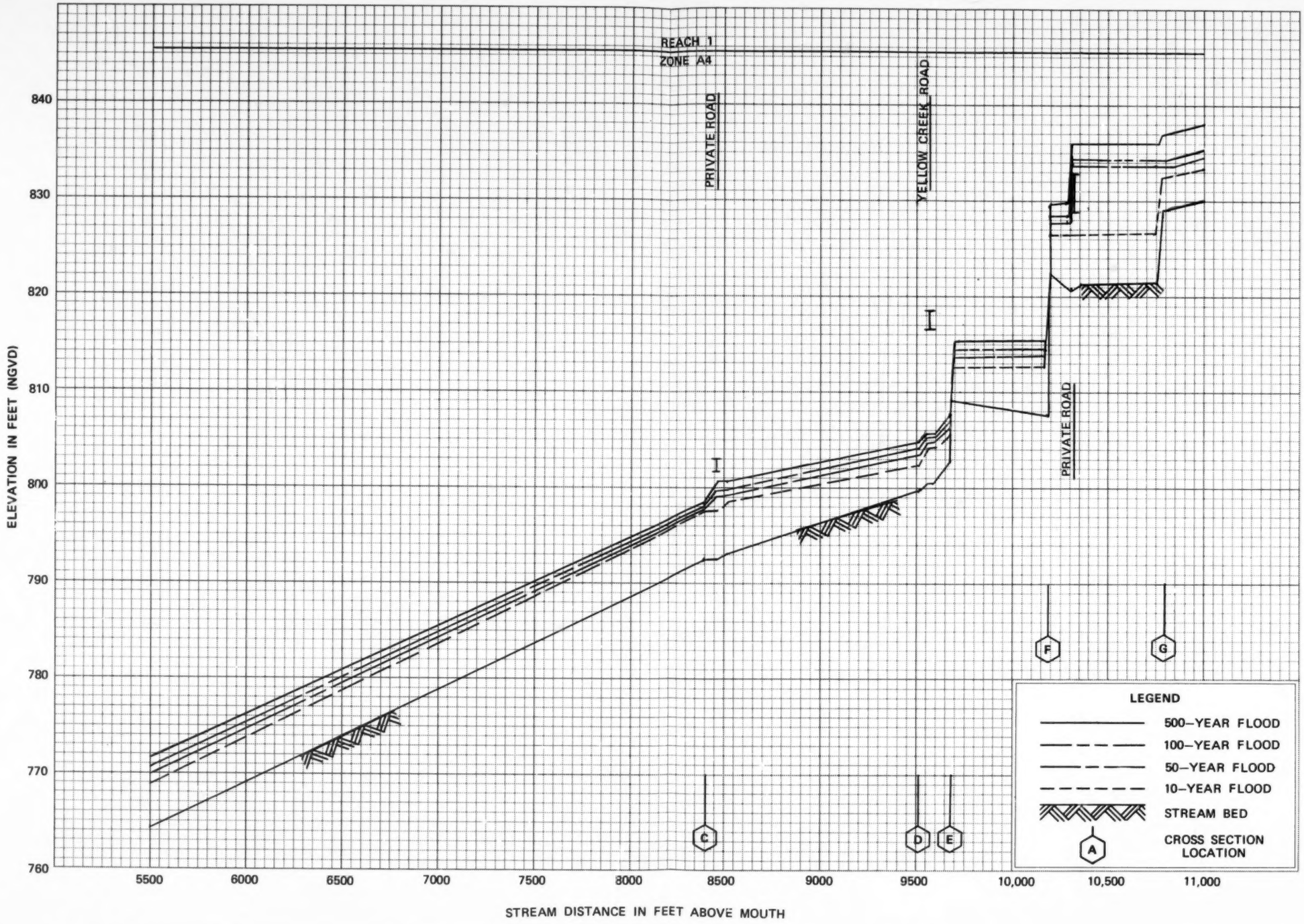


FLOOD PROFILES

YELLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

18P

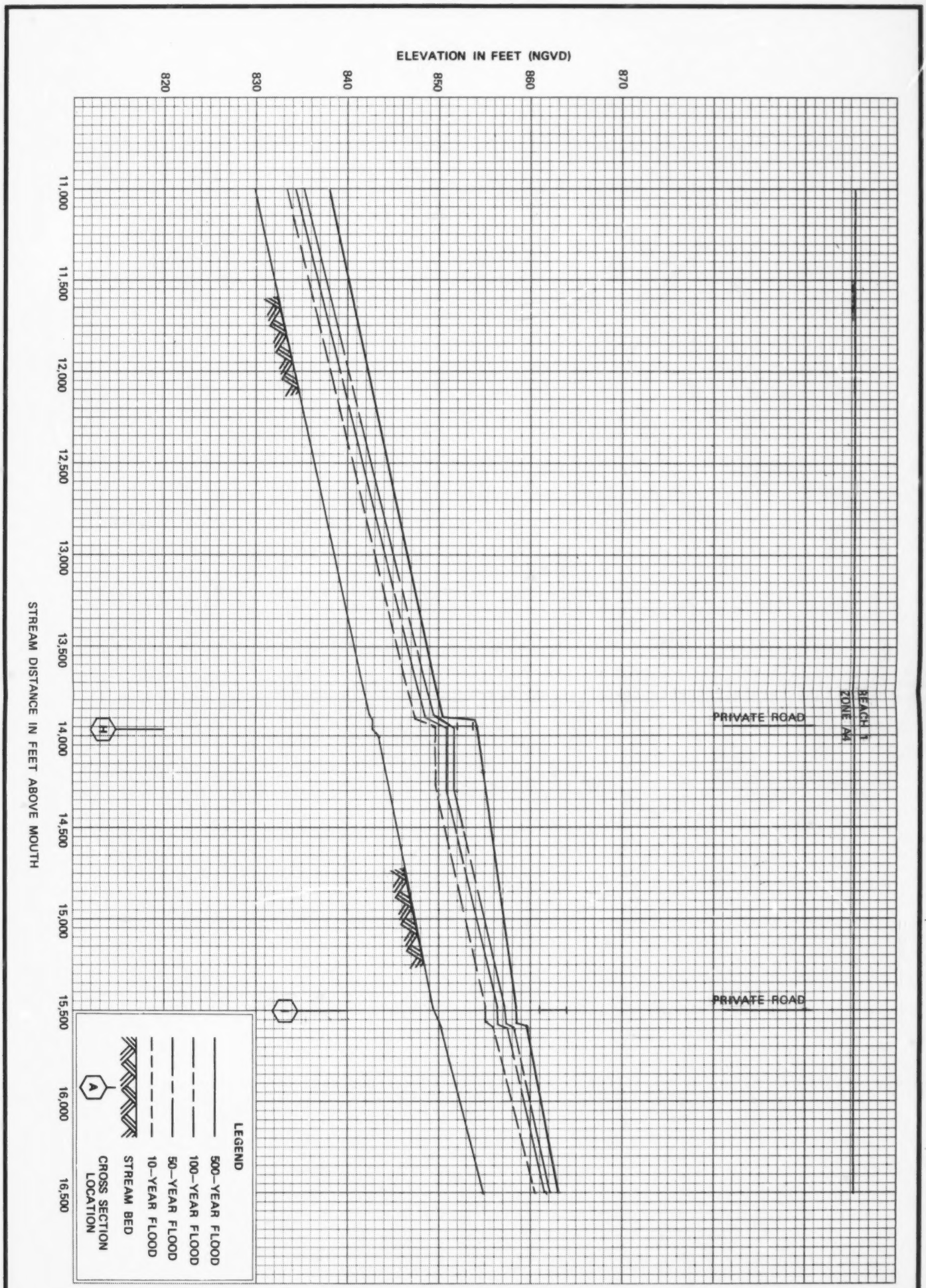


FLOOD PROFILES

YELLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

19P

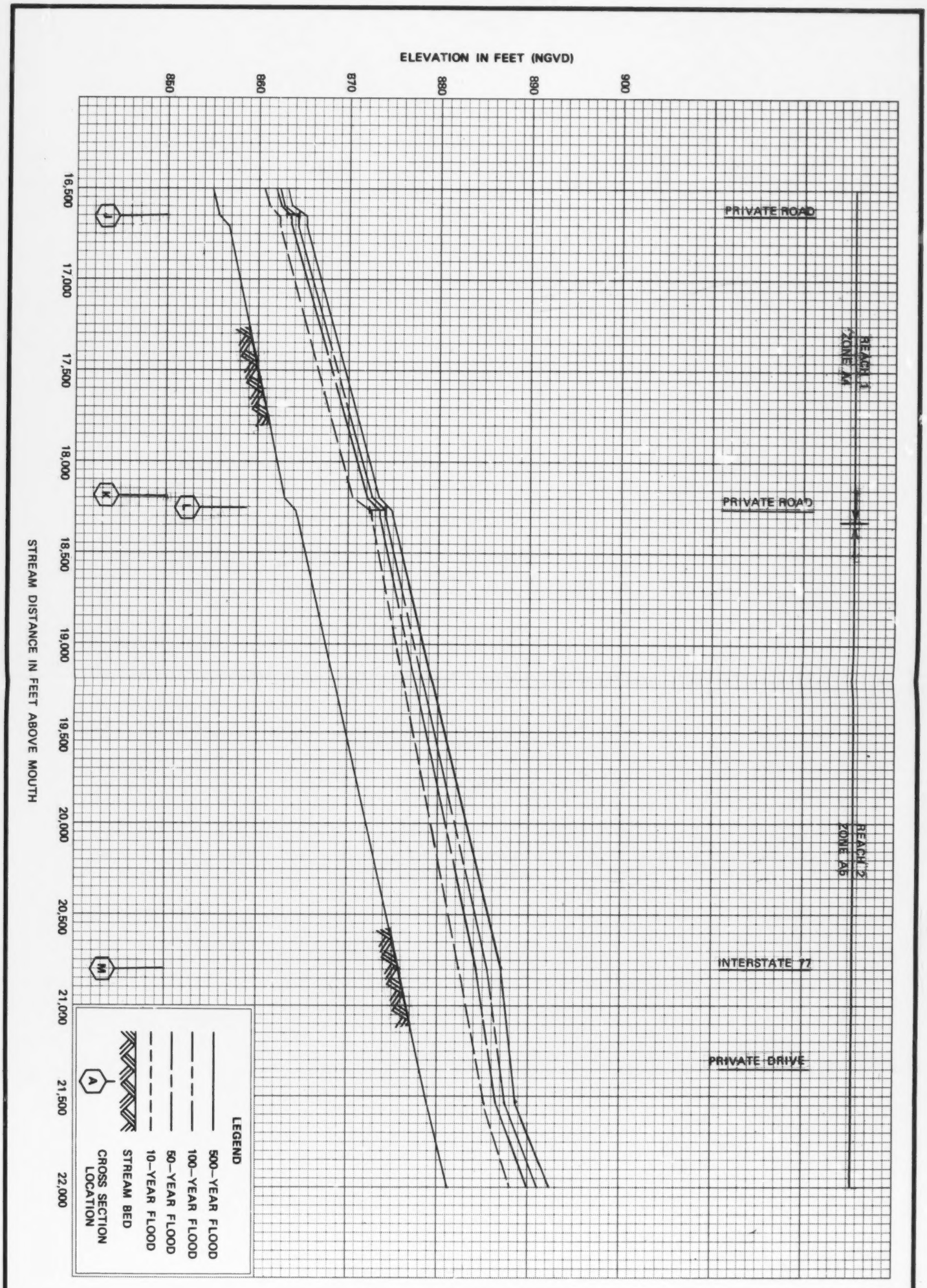


20P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

YELLOW CREEK

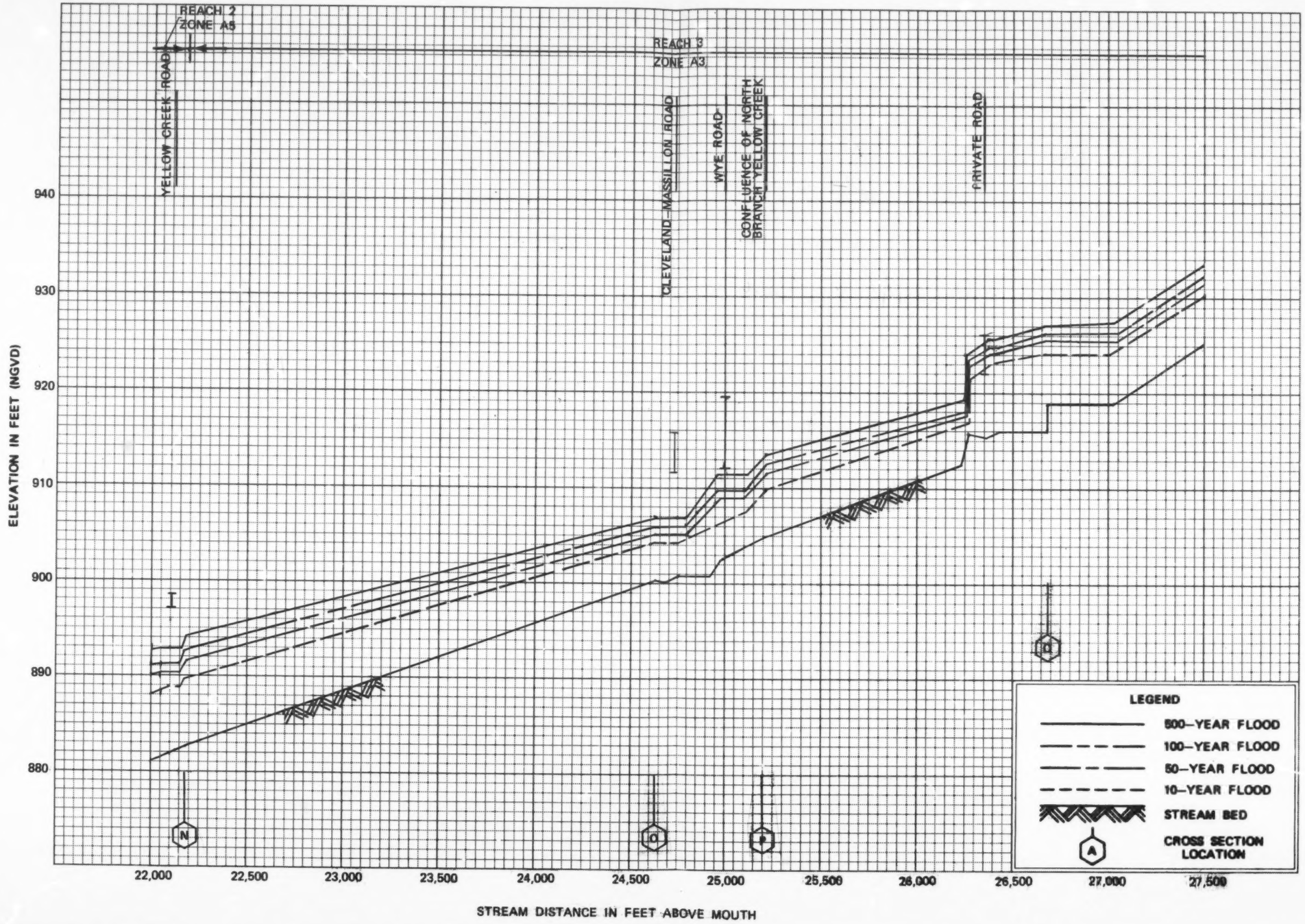


21P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

YELLOW CREEK



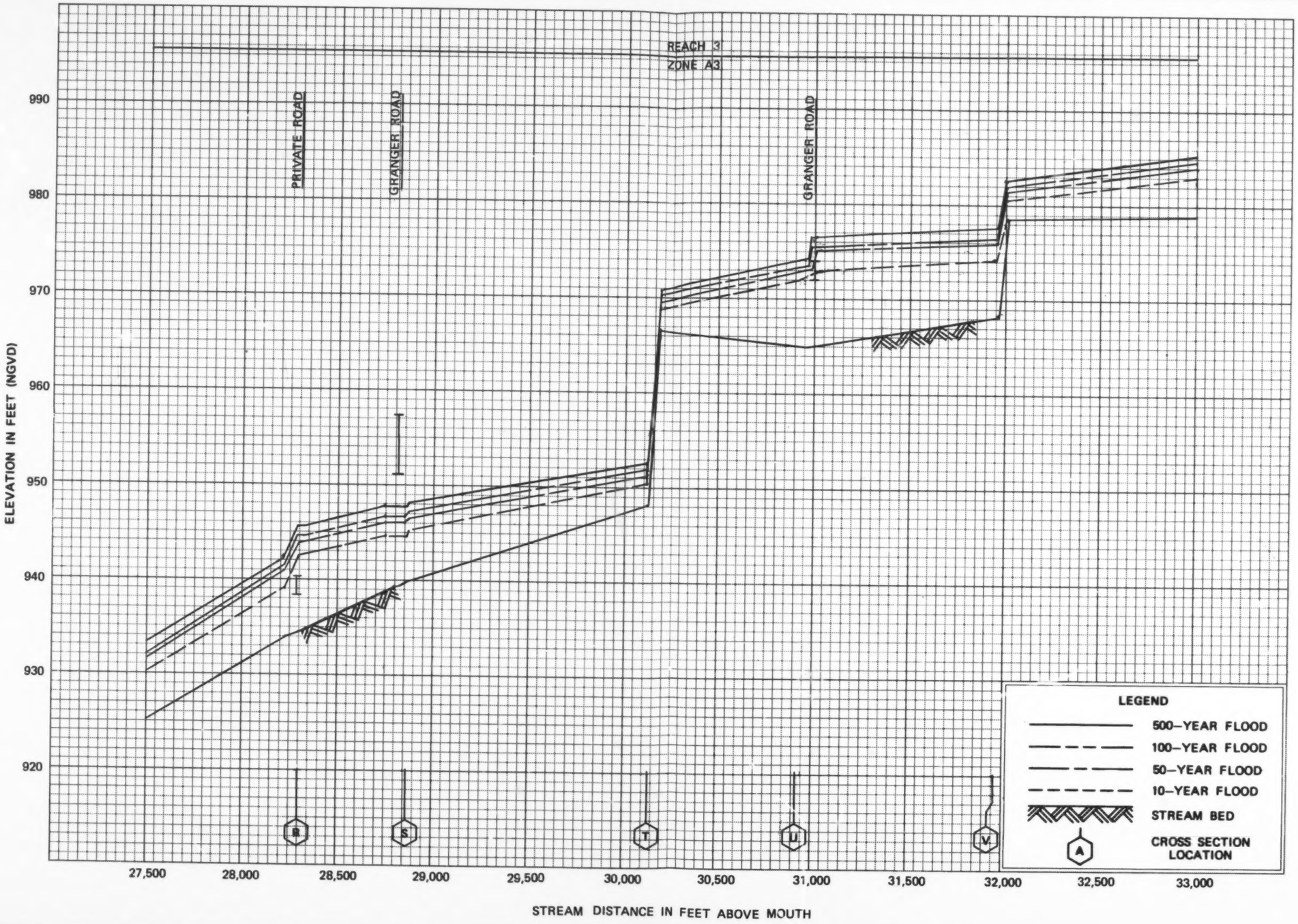
FLOOD PROFILES

YELLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

22P



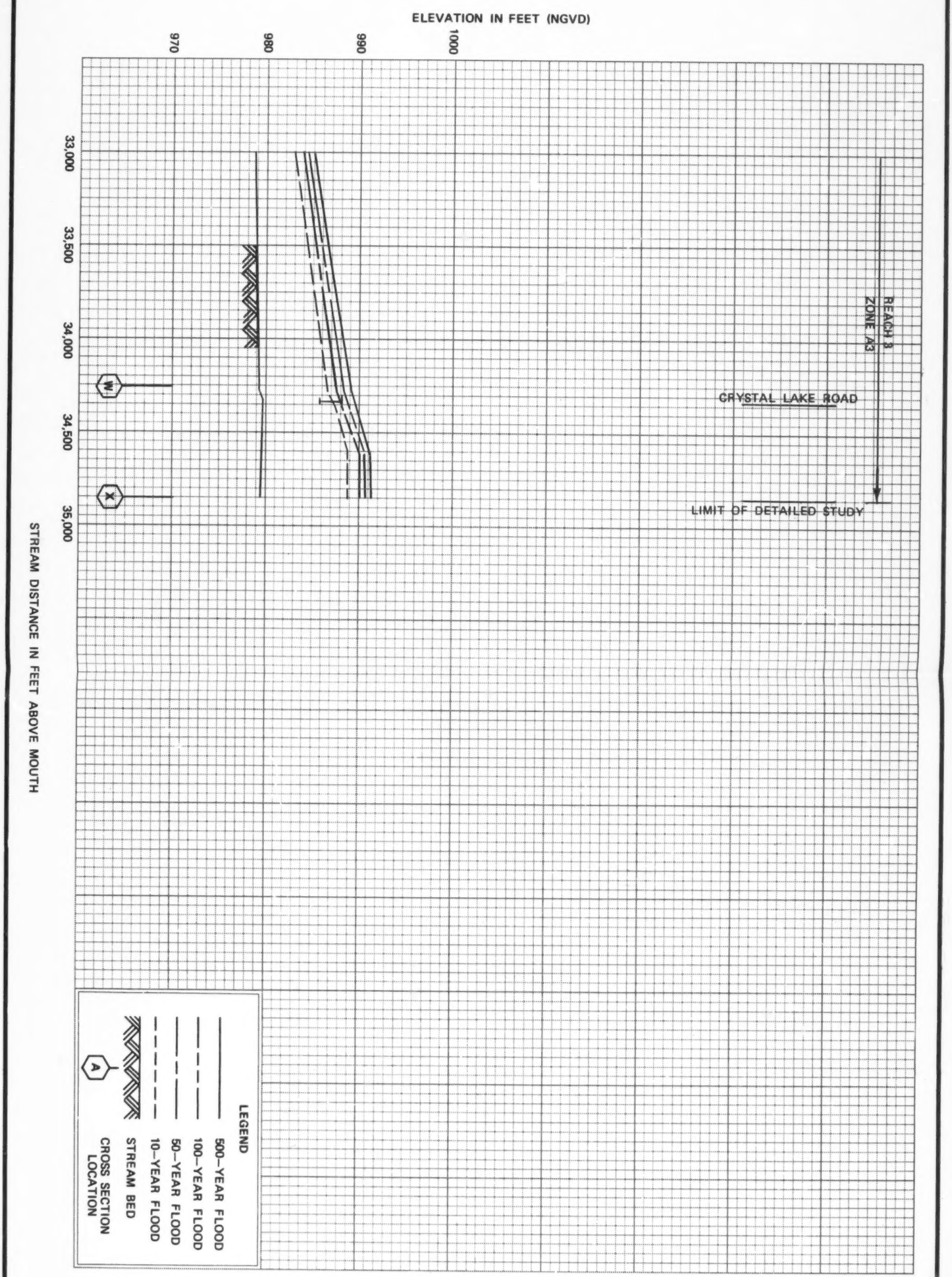
FLOOD PROFILES

YELLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

23P

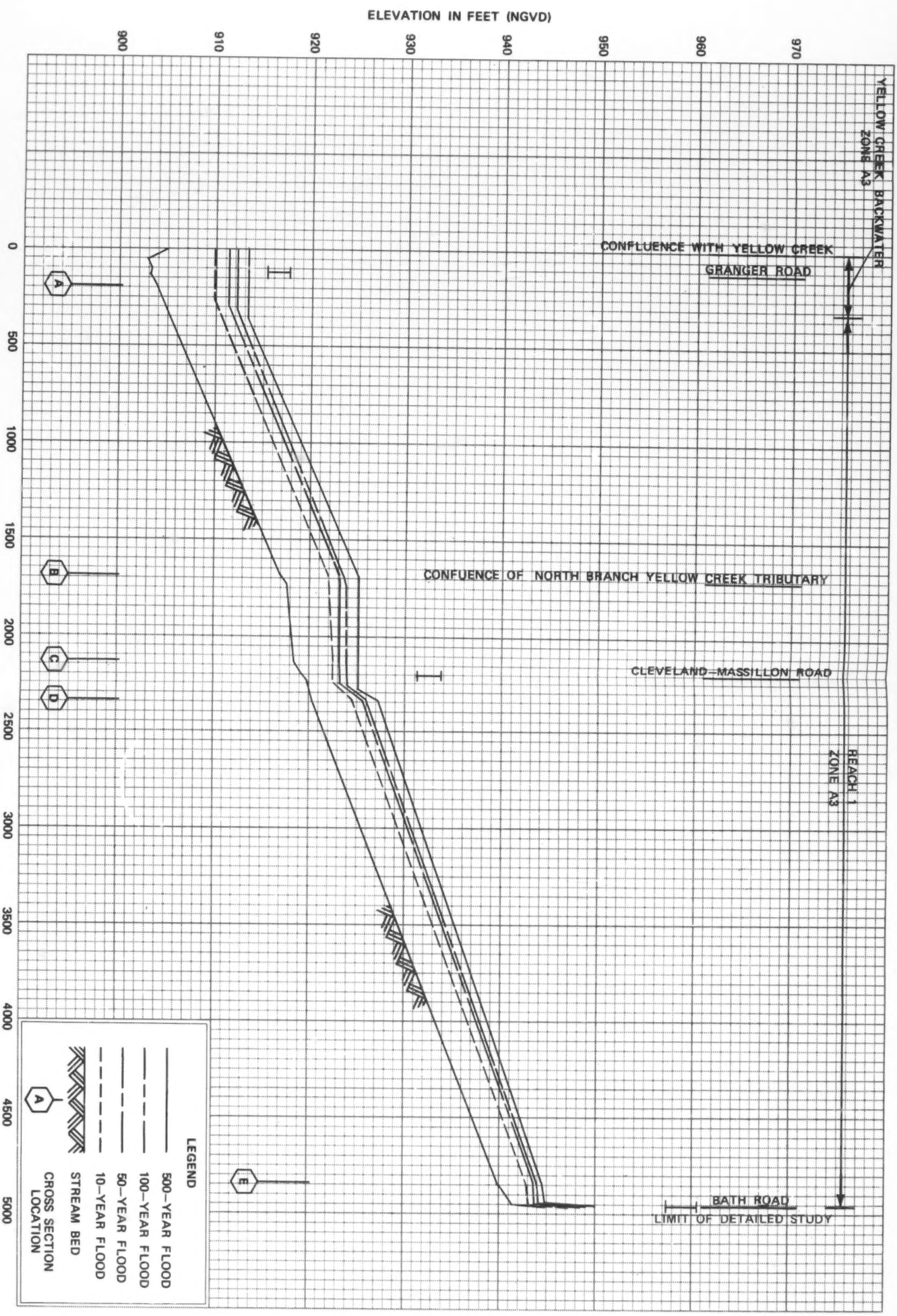


24P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

YELLOW CREEK

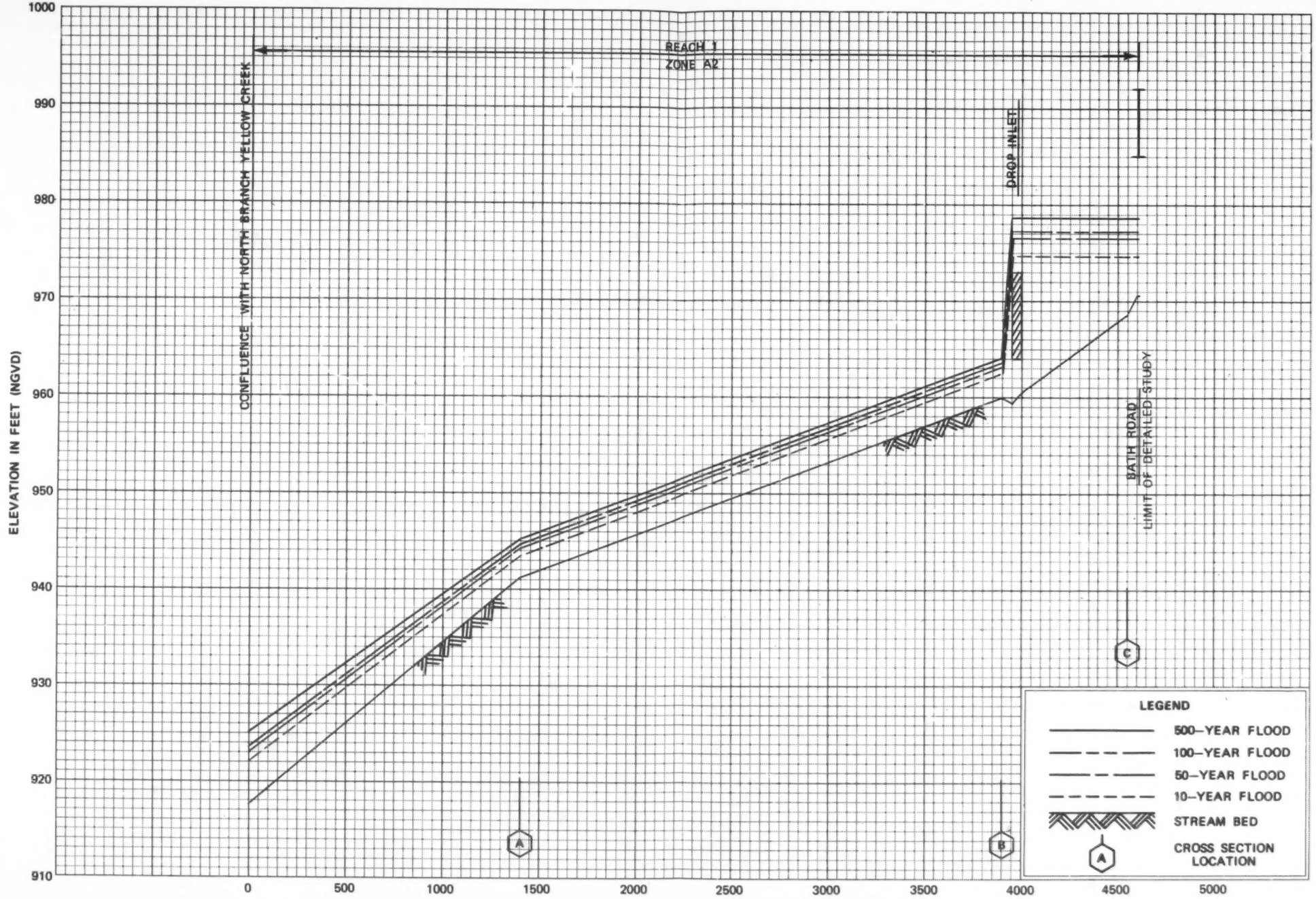


25P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

NORTH BRANCH YELLOW CREEK



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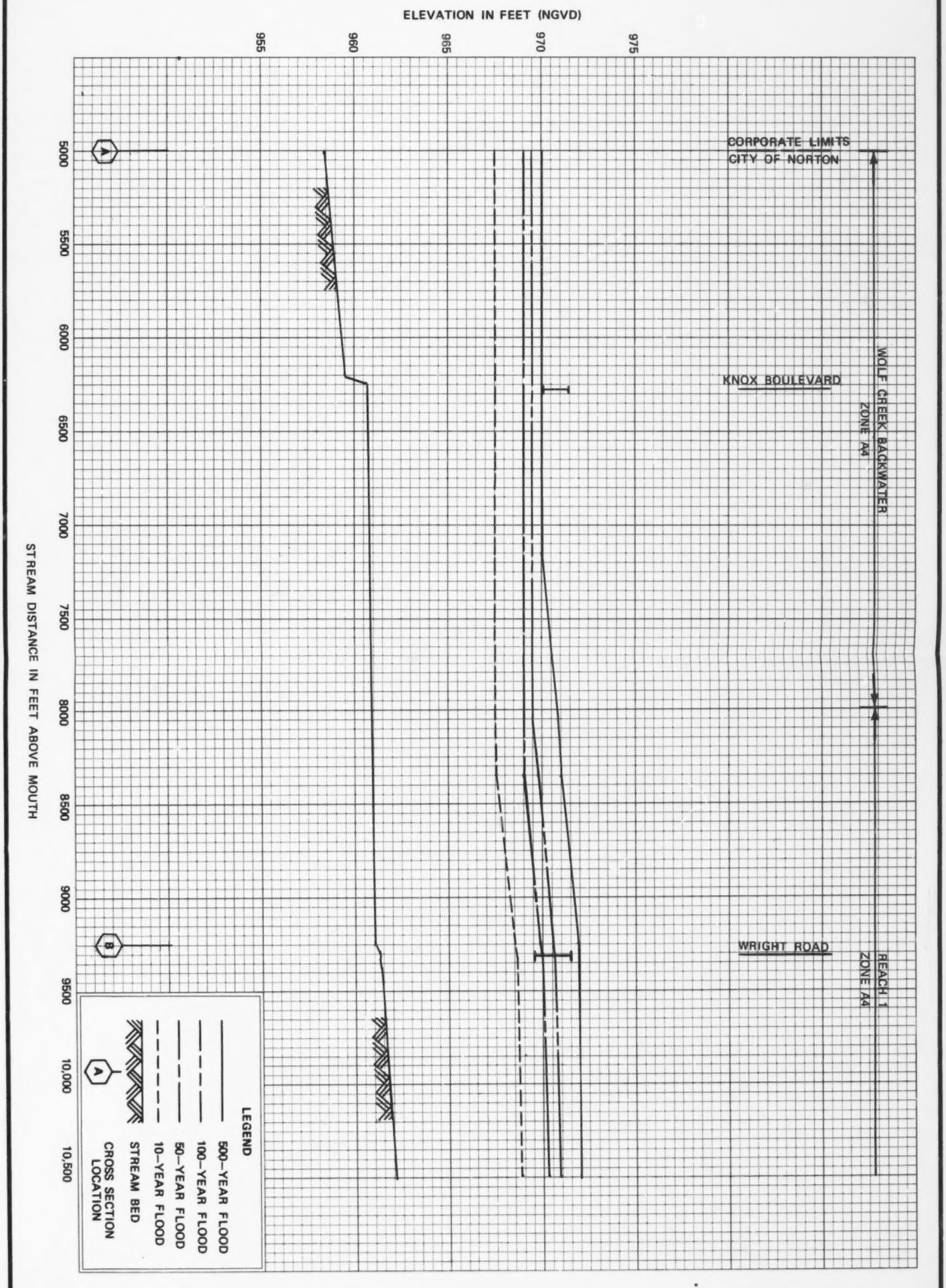
FLOOD PROFILES

NORTH BRANCH YELLOW CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

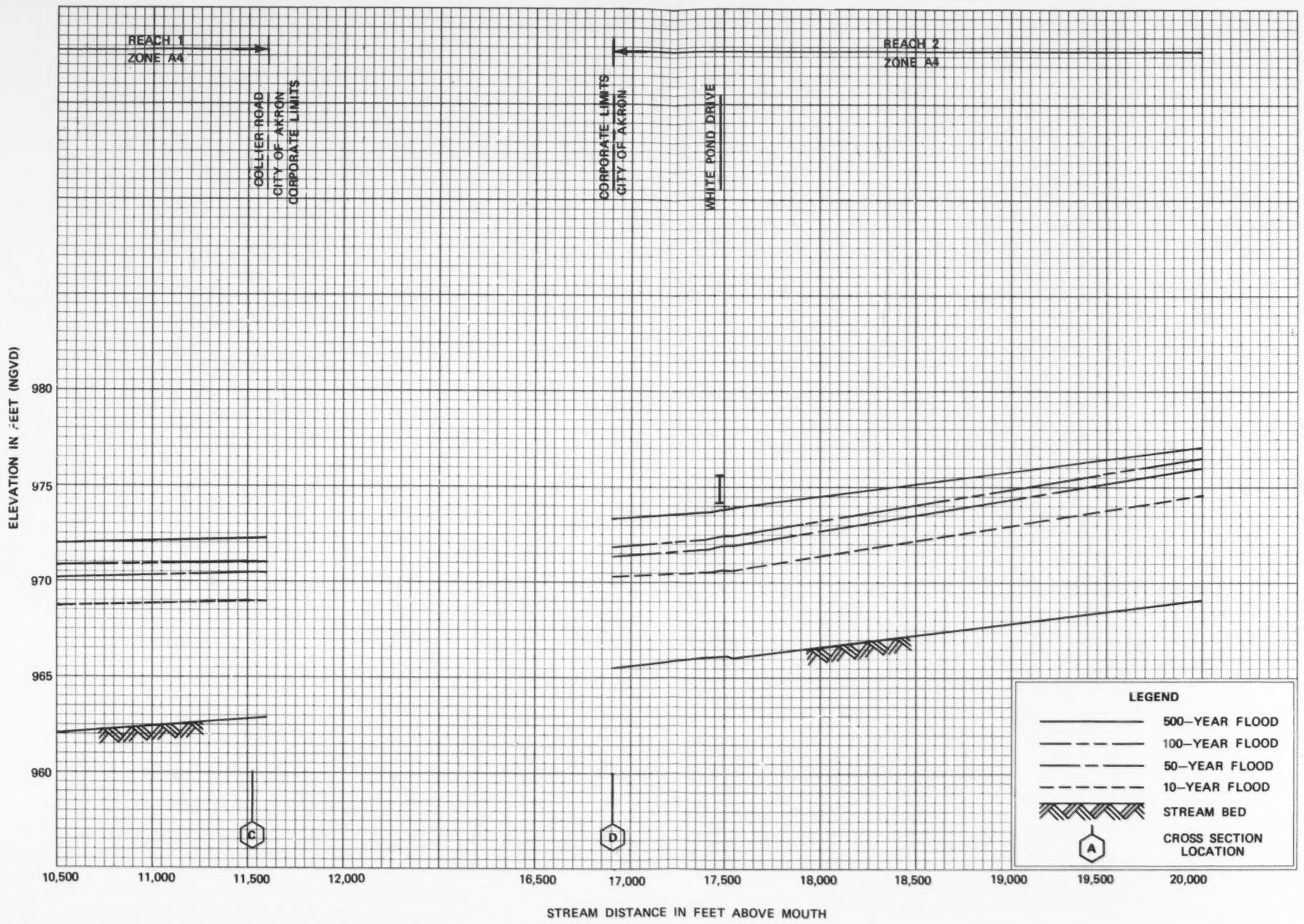


27P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

PIGEON CREEK

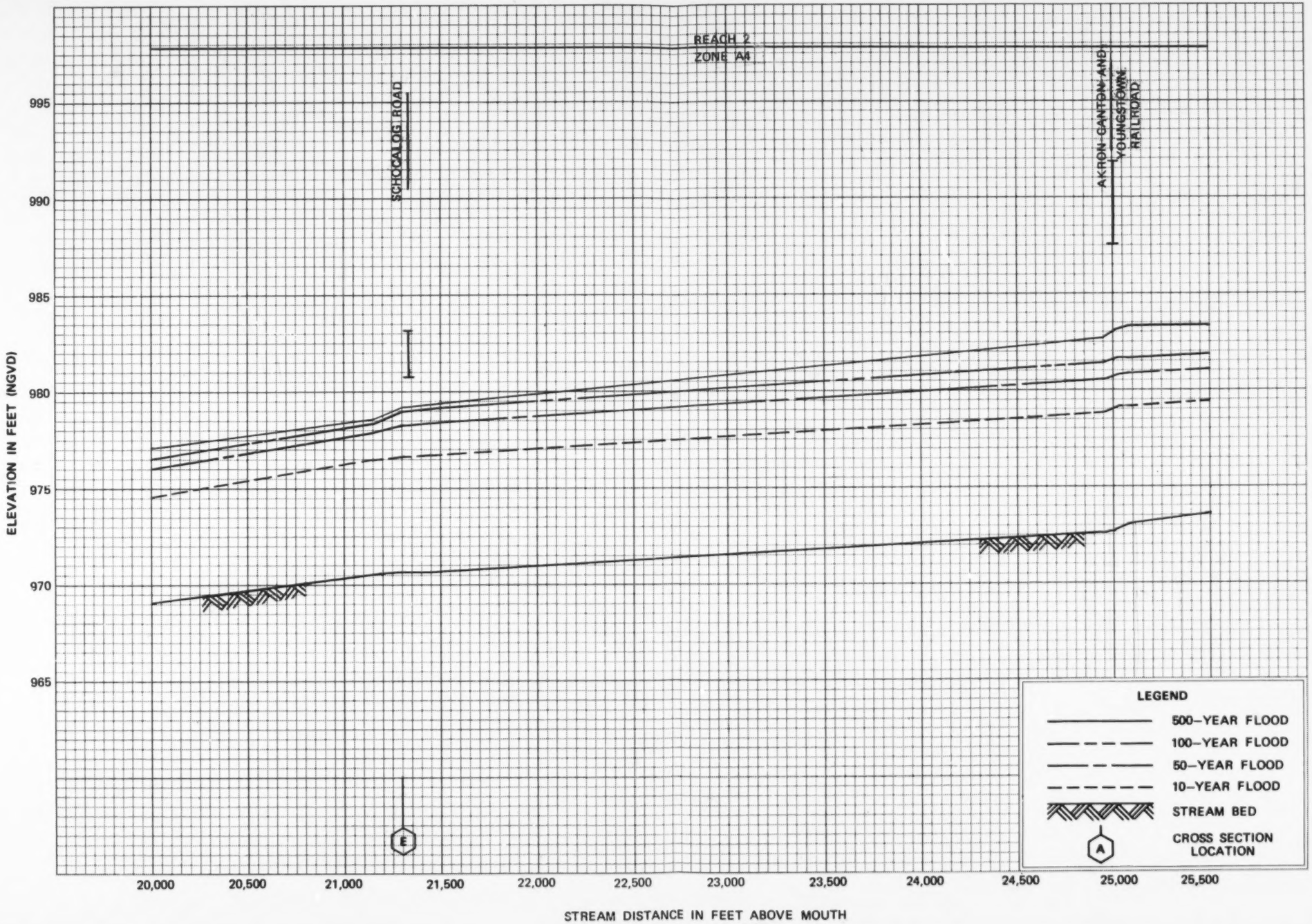


FLOOD PROFILES

PIGEON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

28P



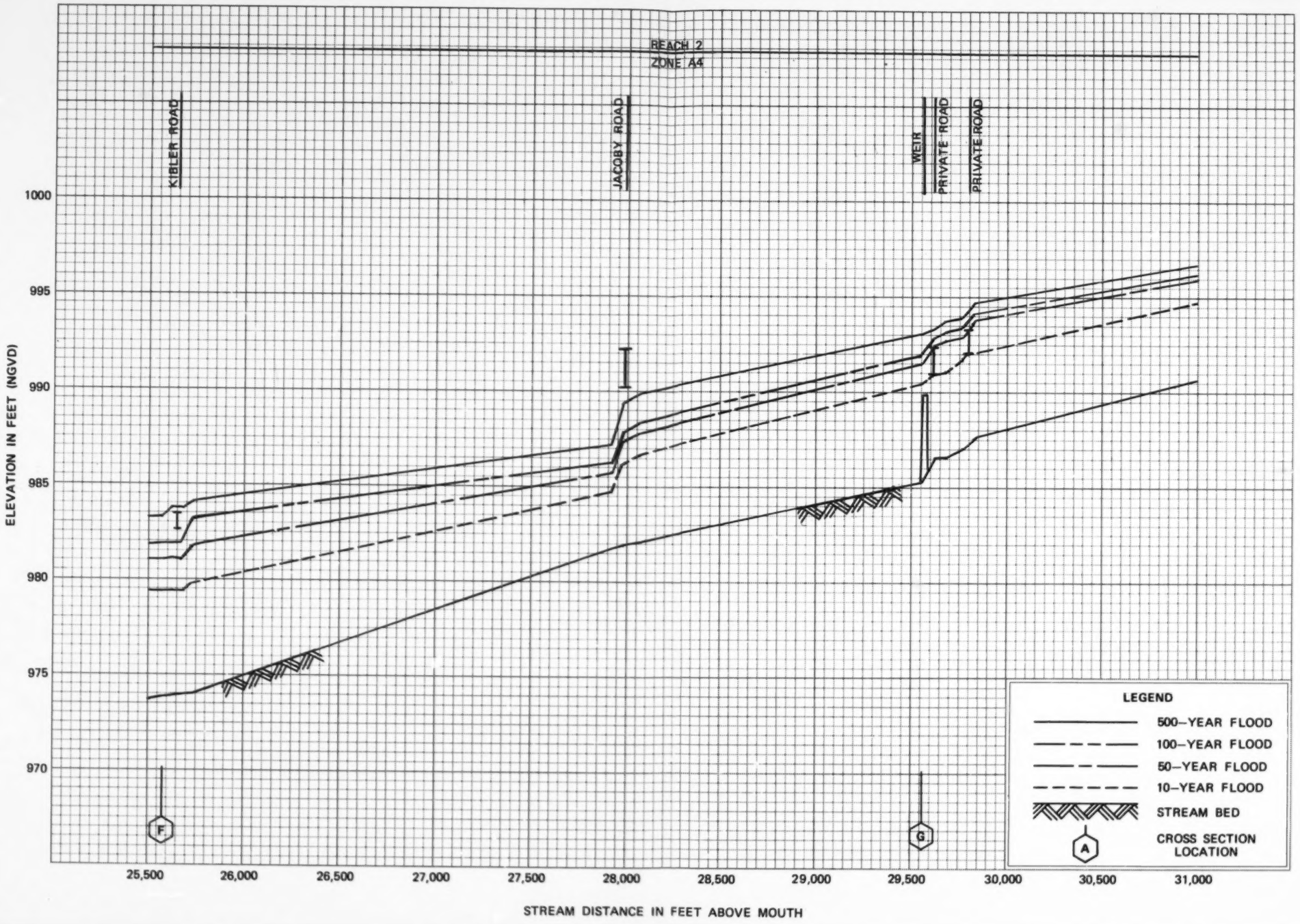
FLOOD PROFILES

PIGEON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

29P



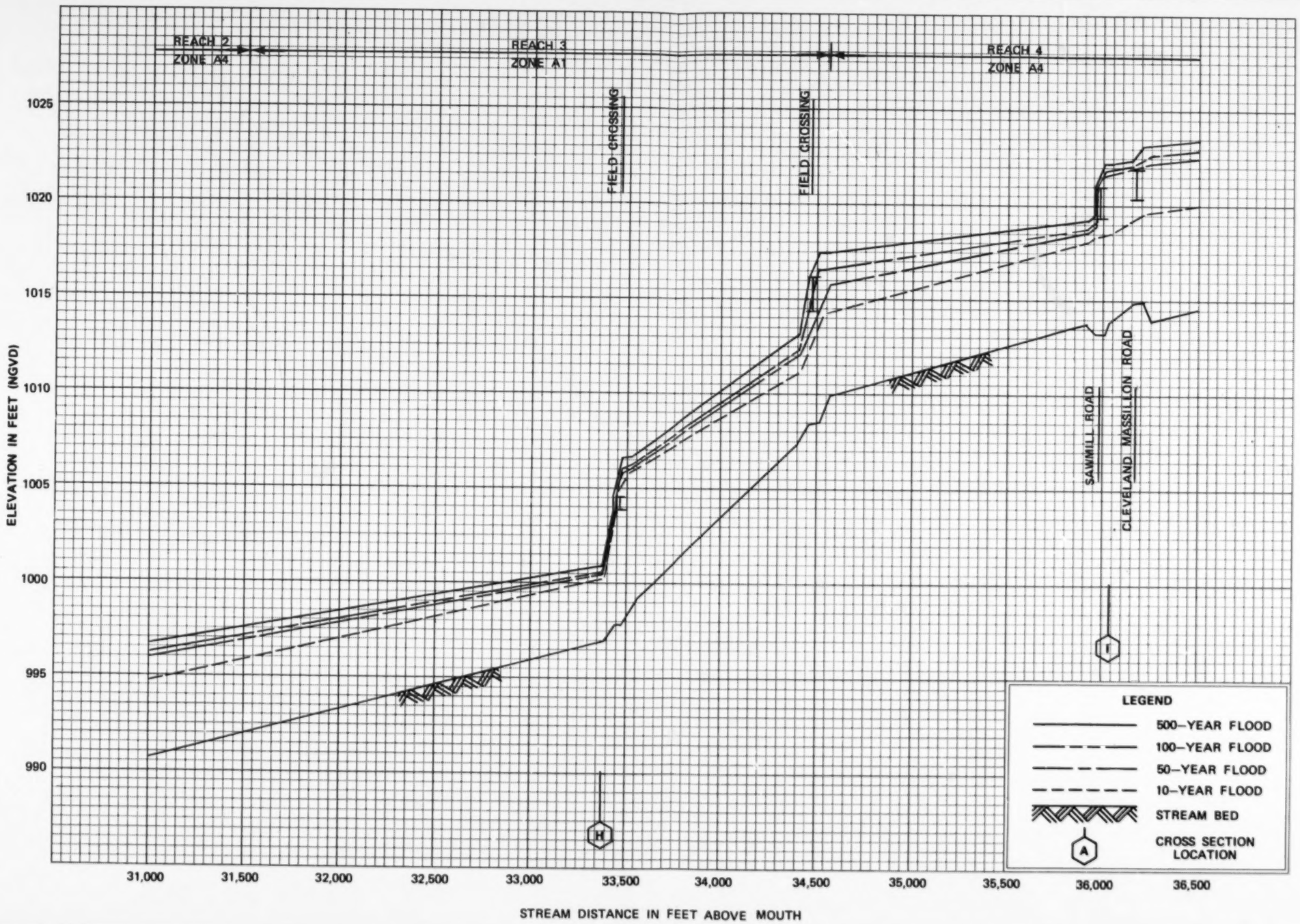
FLOOD PROFILES

PIGEON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

30P

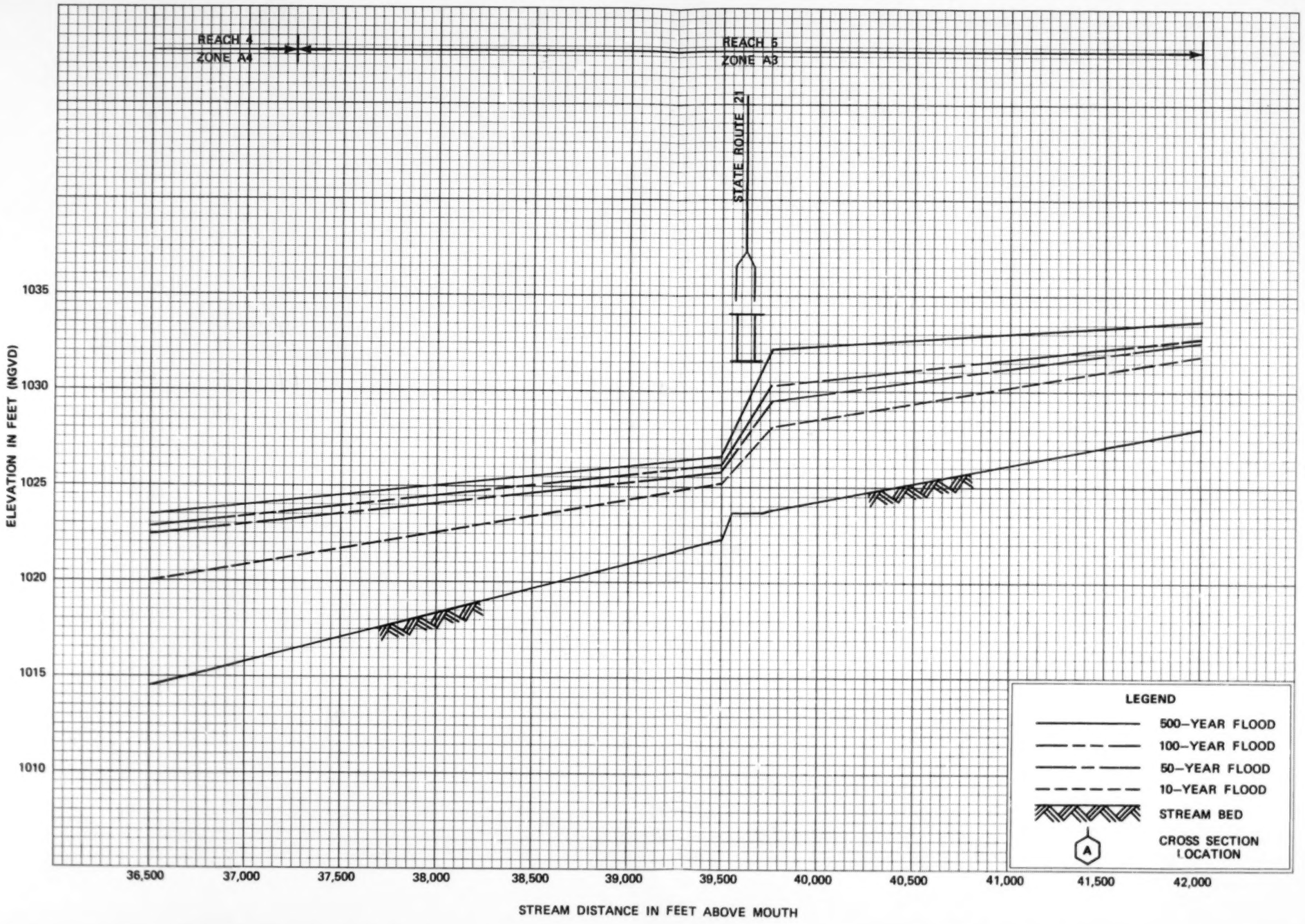


FLOOD PROFILES

PIGEON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

31P



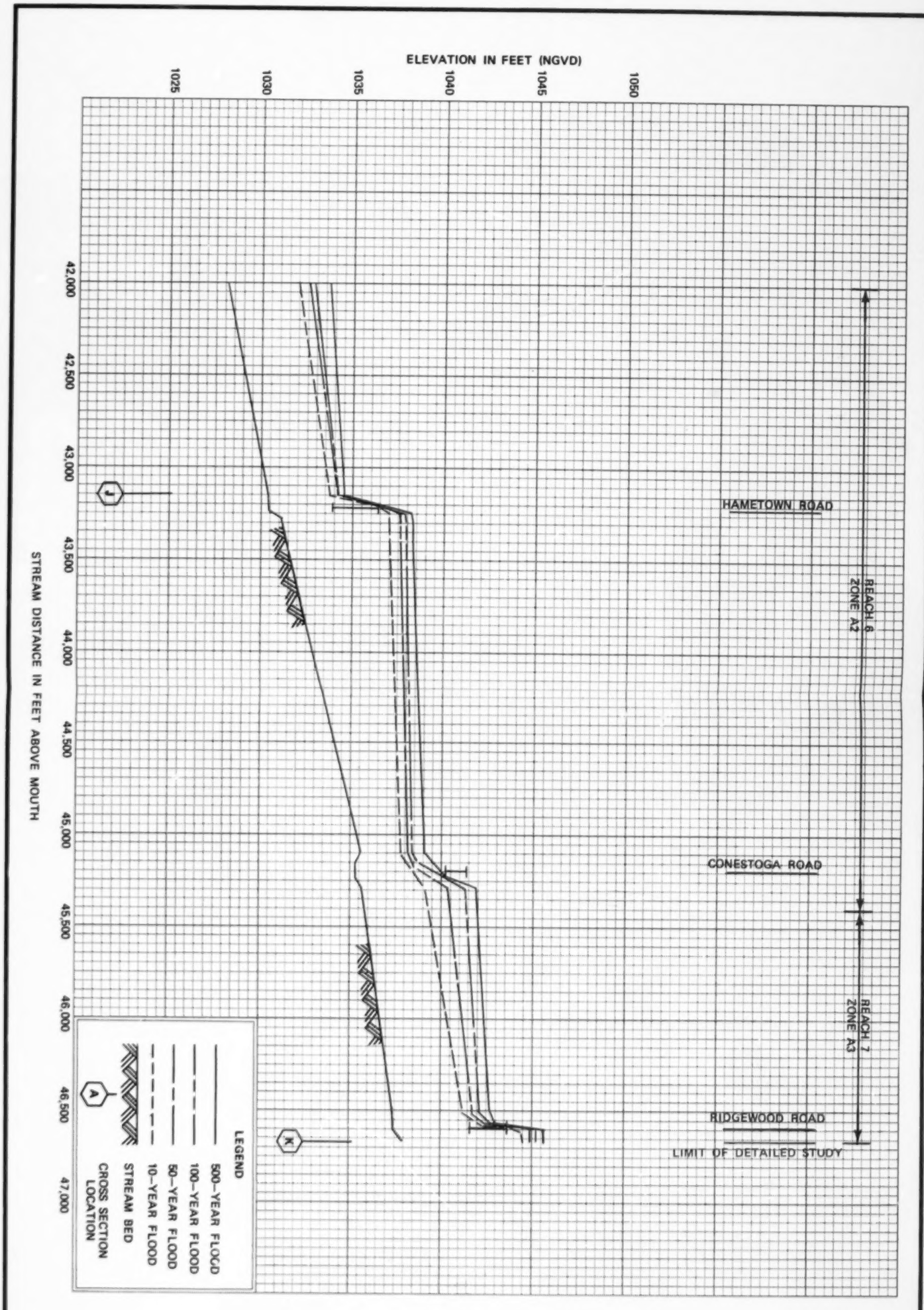
FLOOD PROFILES

PIGEON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

32P

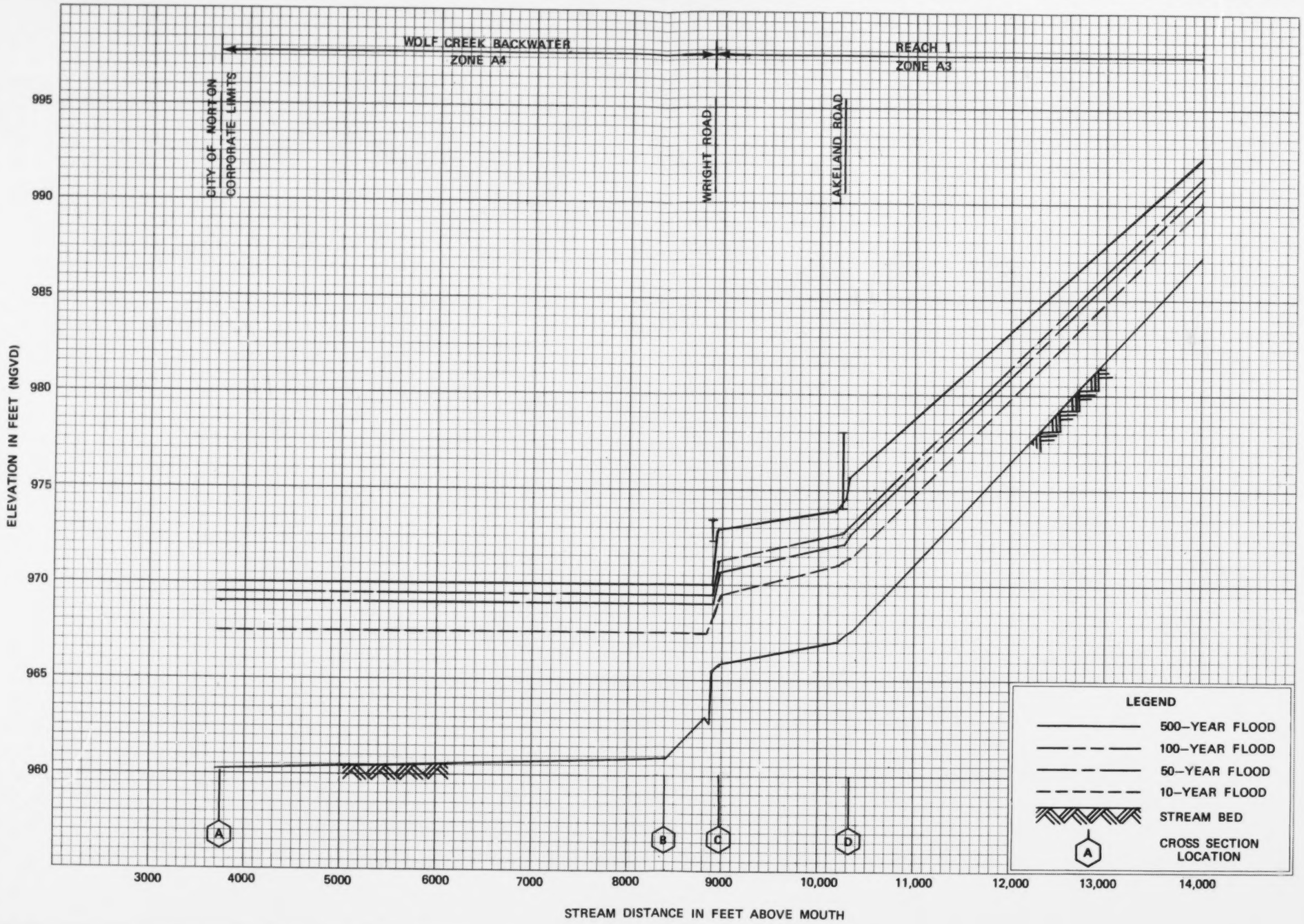


33P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

PIGEON CREEK



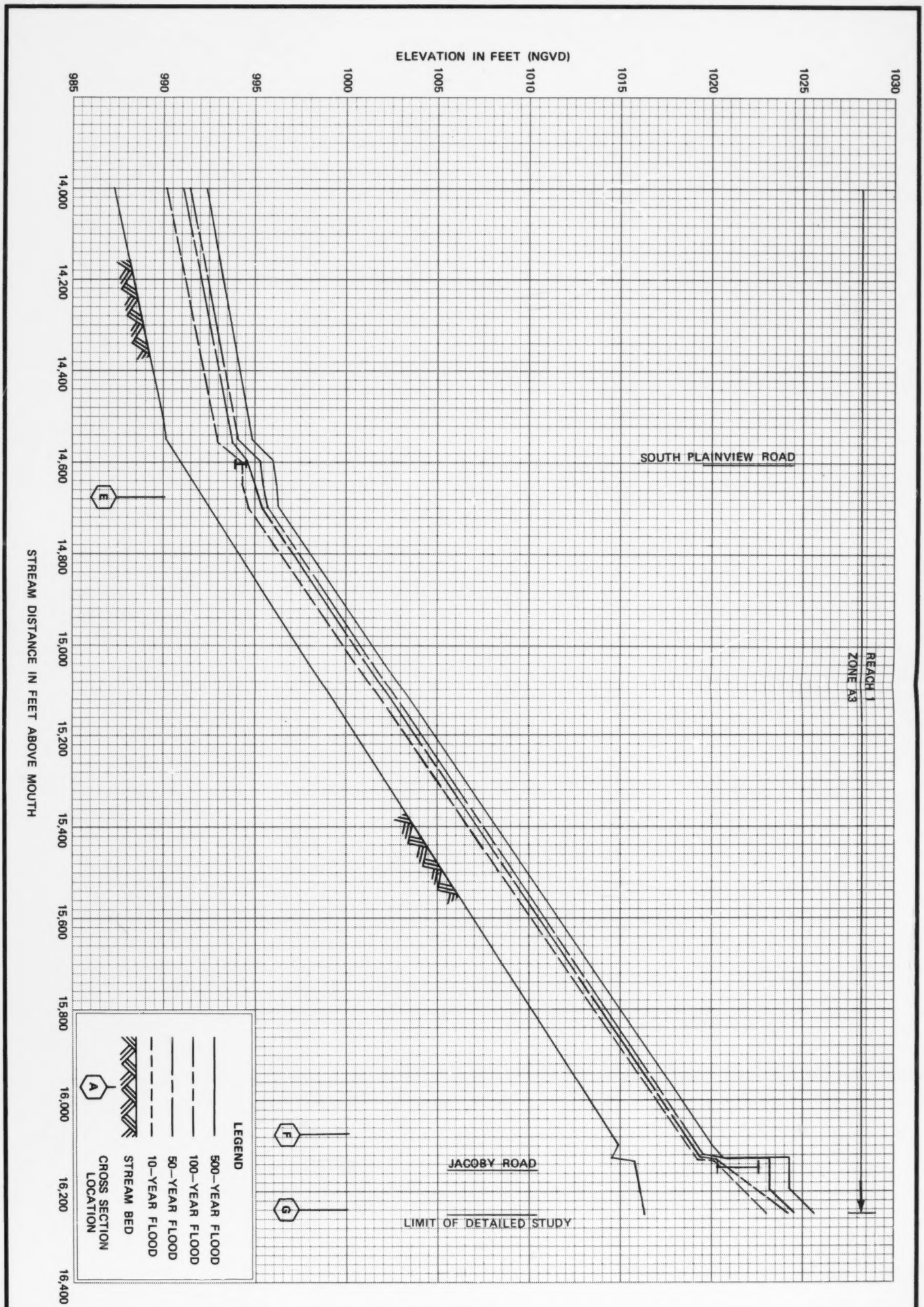
FLOOD PROFILES

PIGEON CREEK TRIBUTARY NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

34P

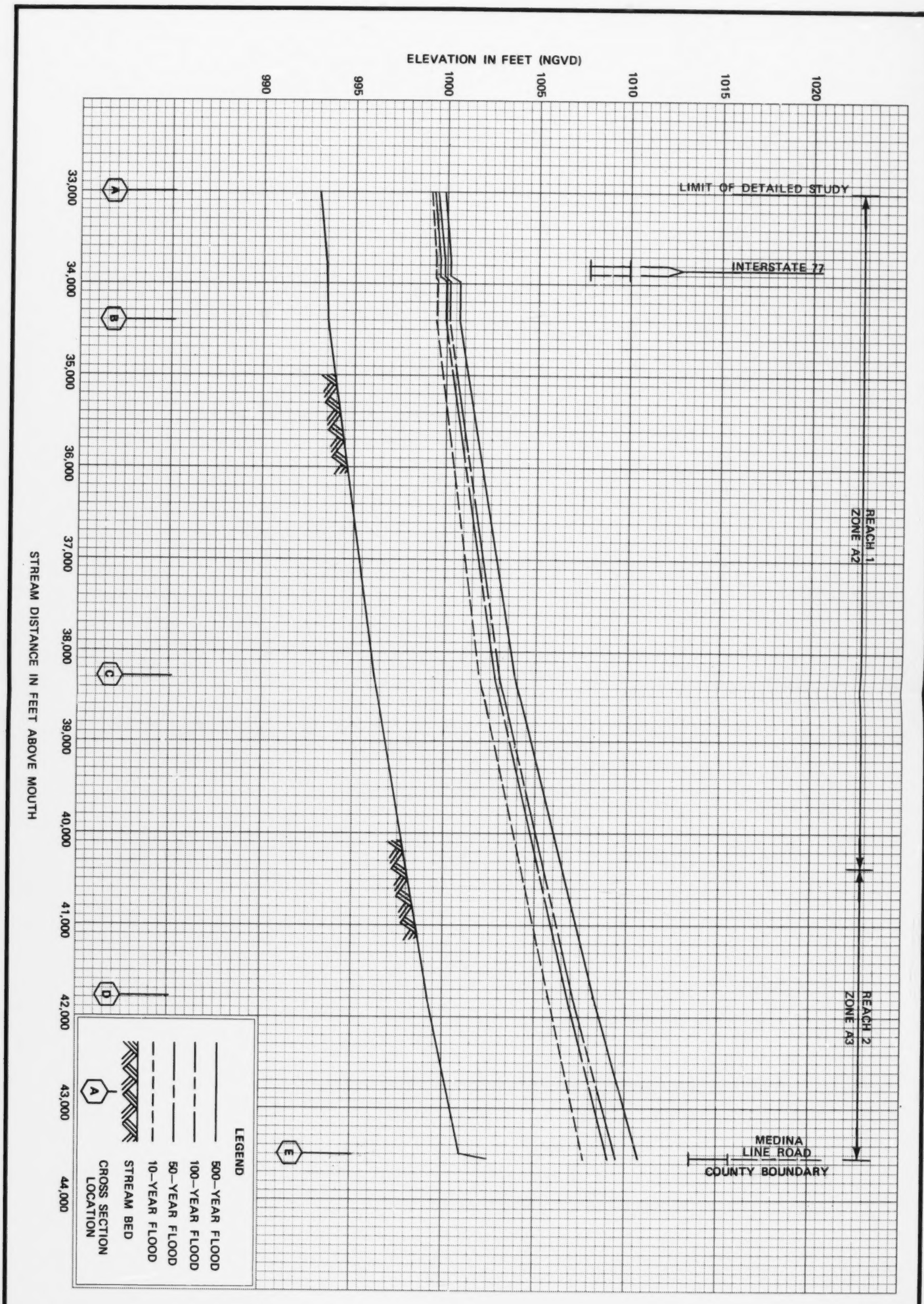


35P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

PIGEON CREEK TRIBUTARY NO. 2

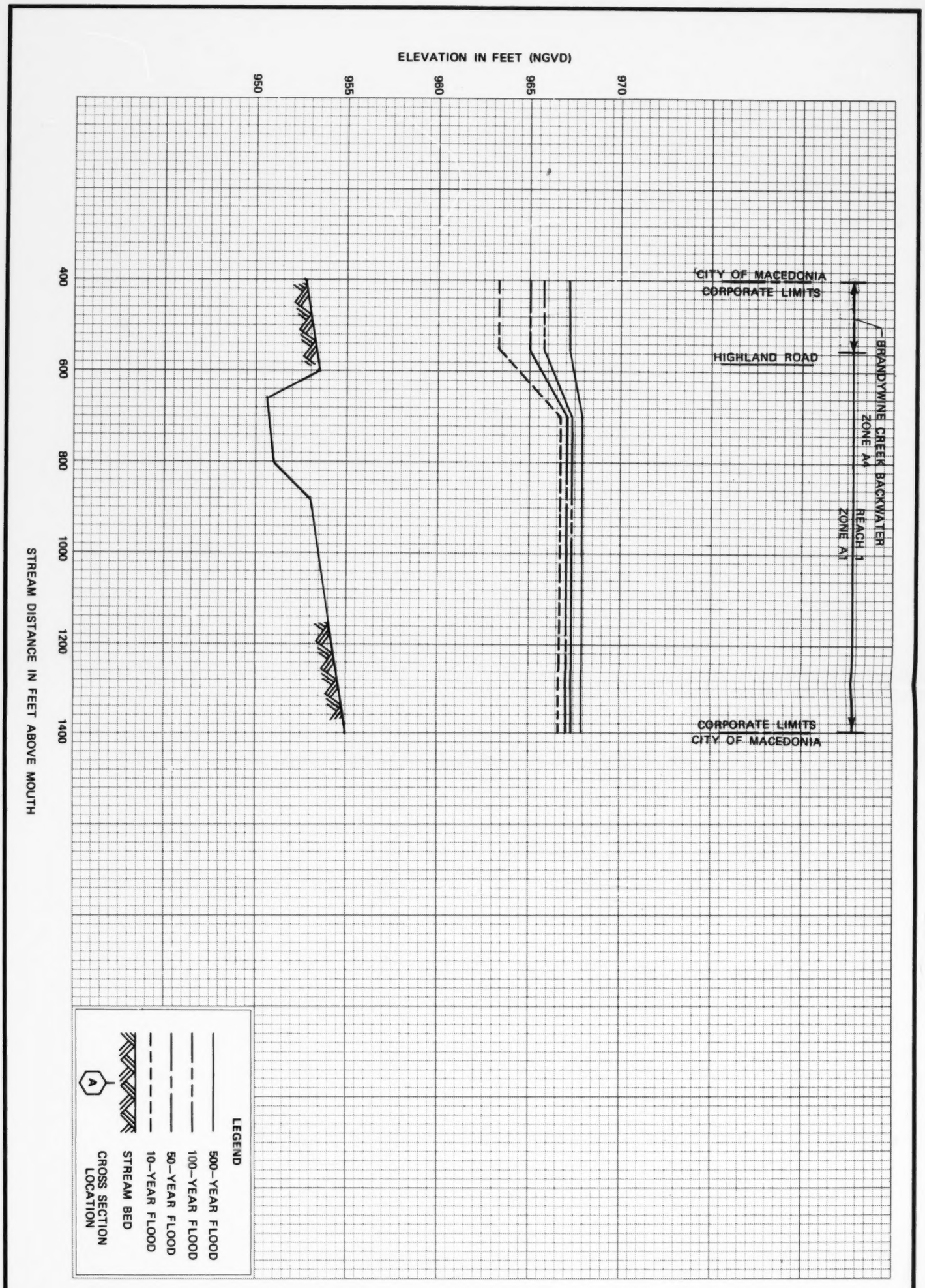


36P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

WOLF CREEK

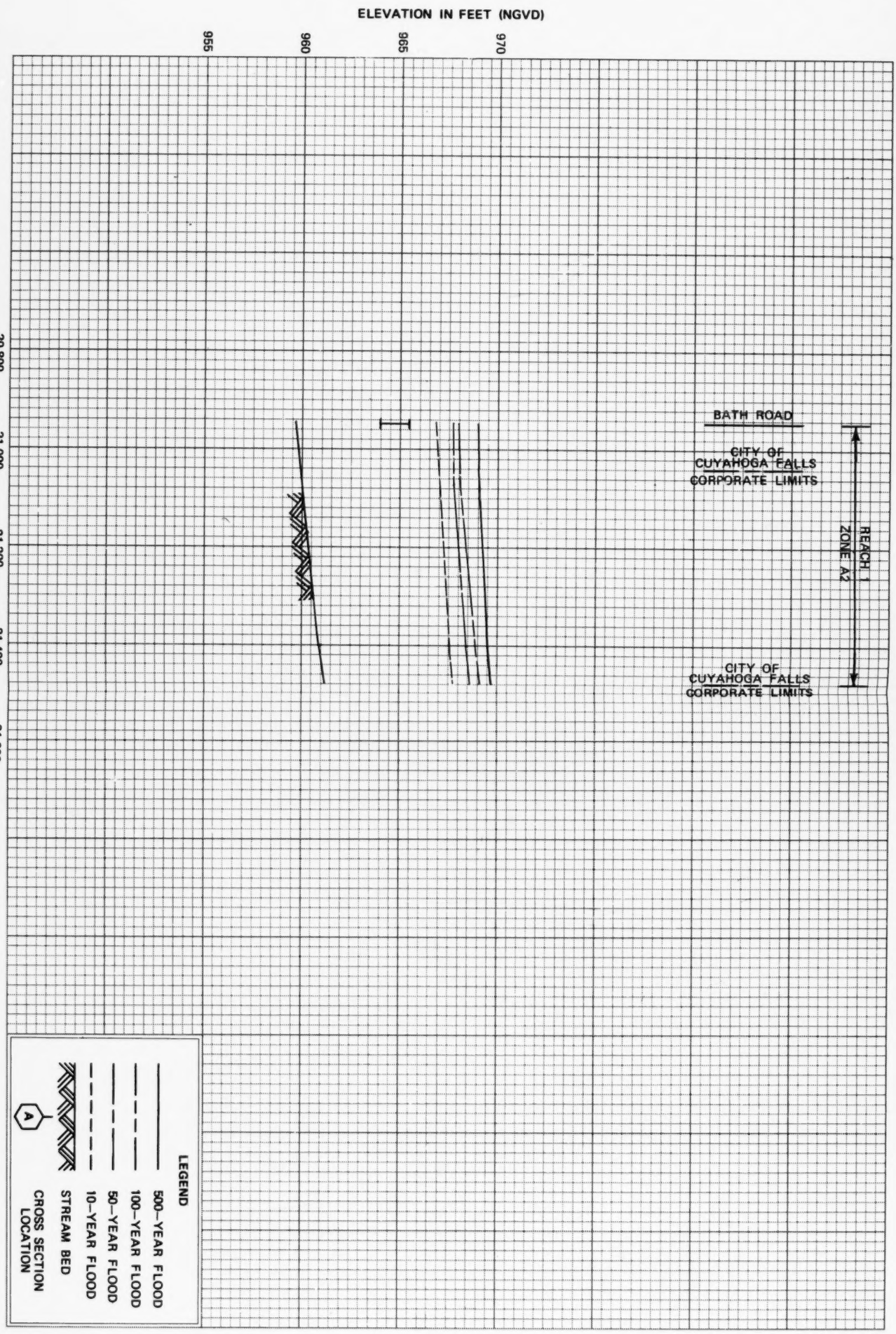


37P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

INDIAN CREEK

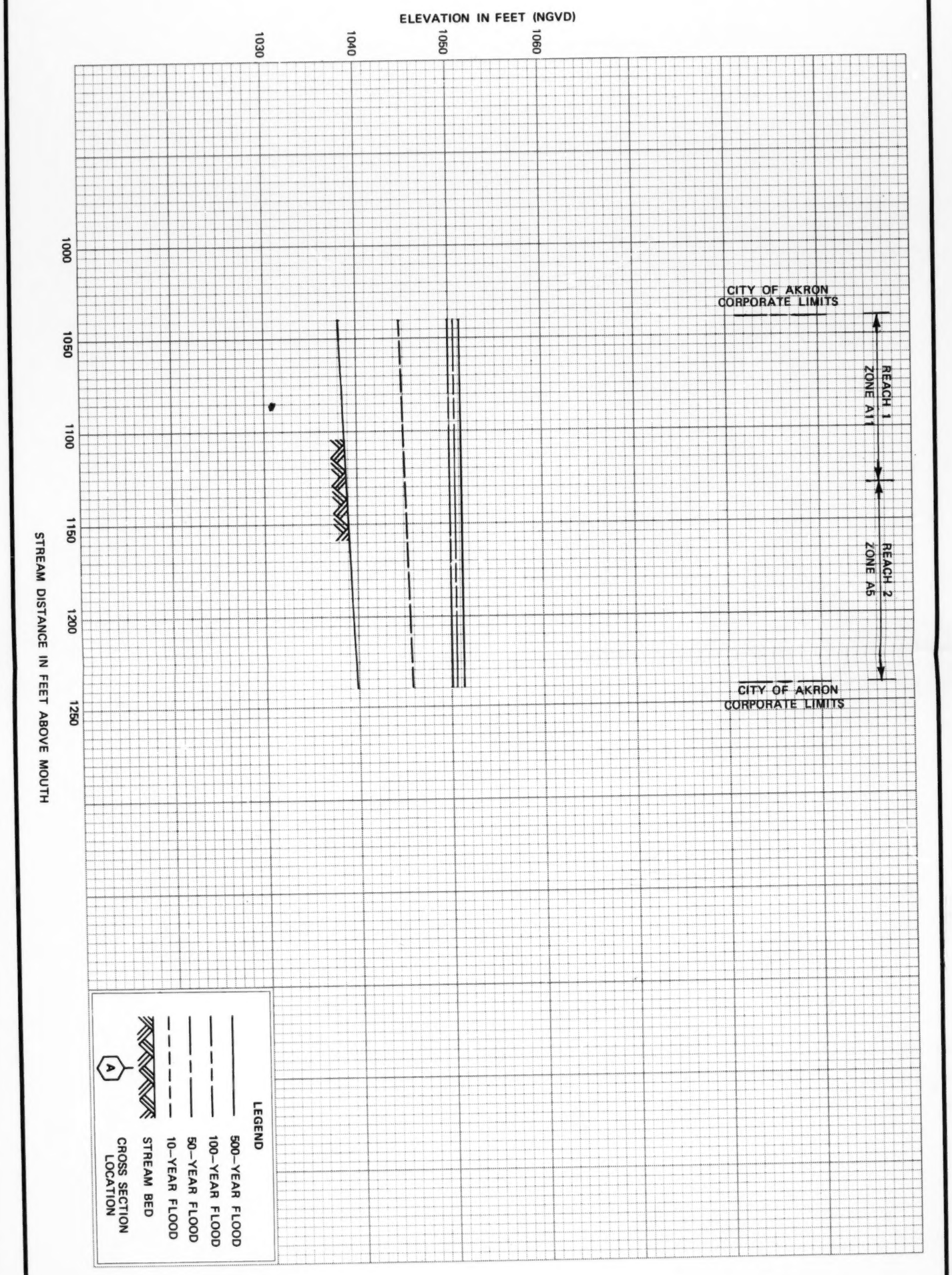


38P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

MUD BROOK

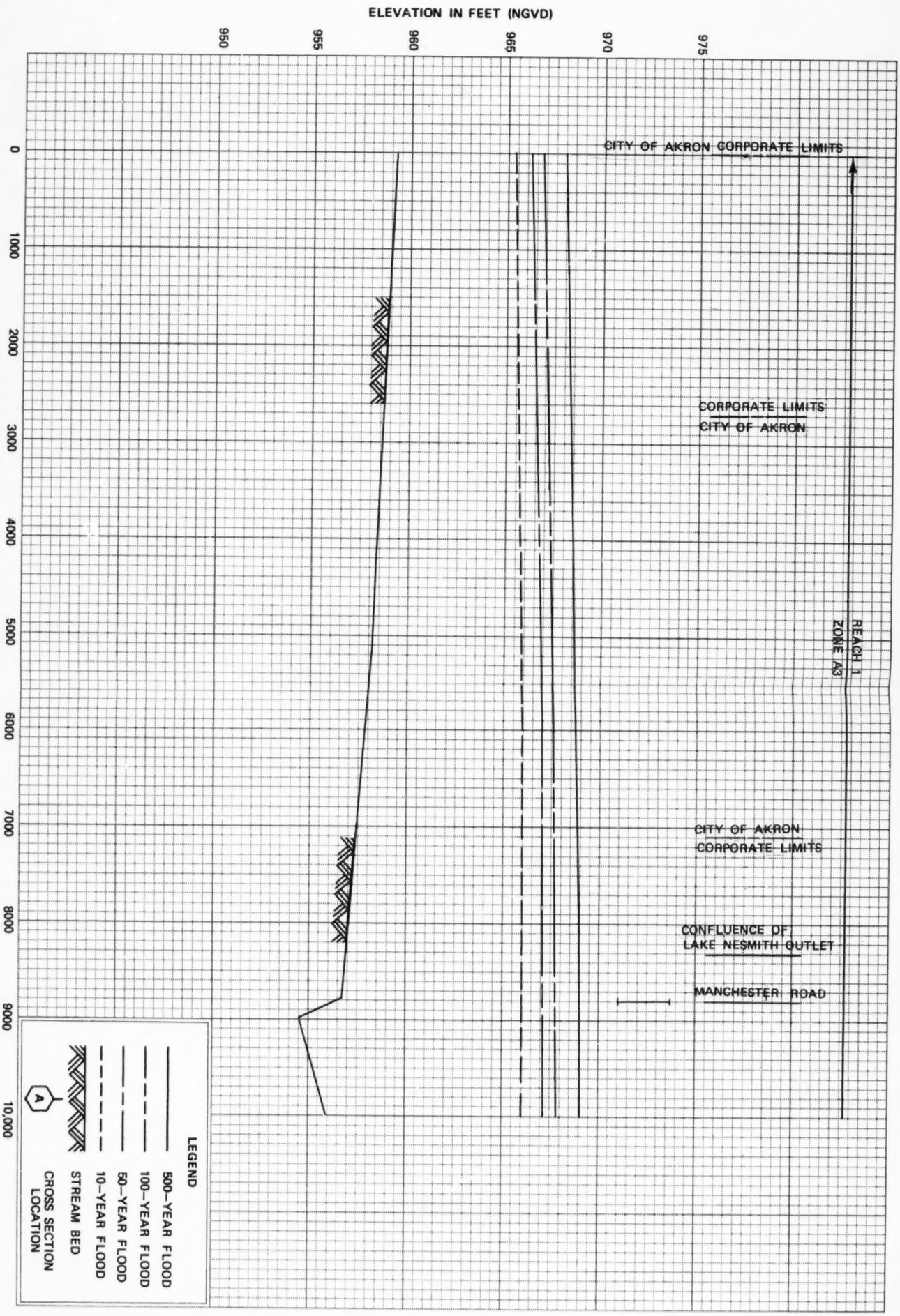


39P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

WEST BRANCH ROOSEVELT DITCH

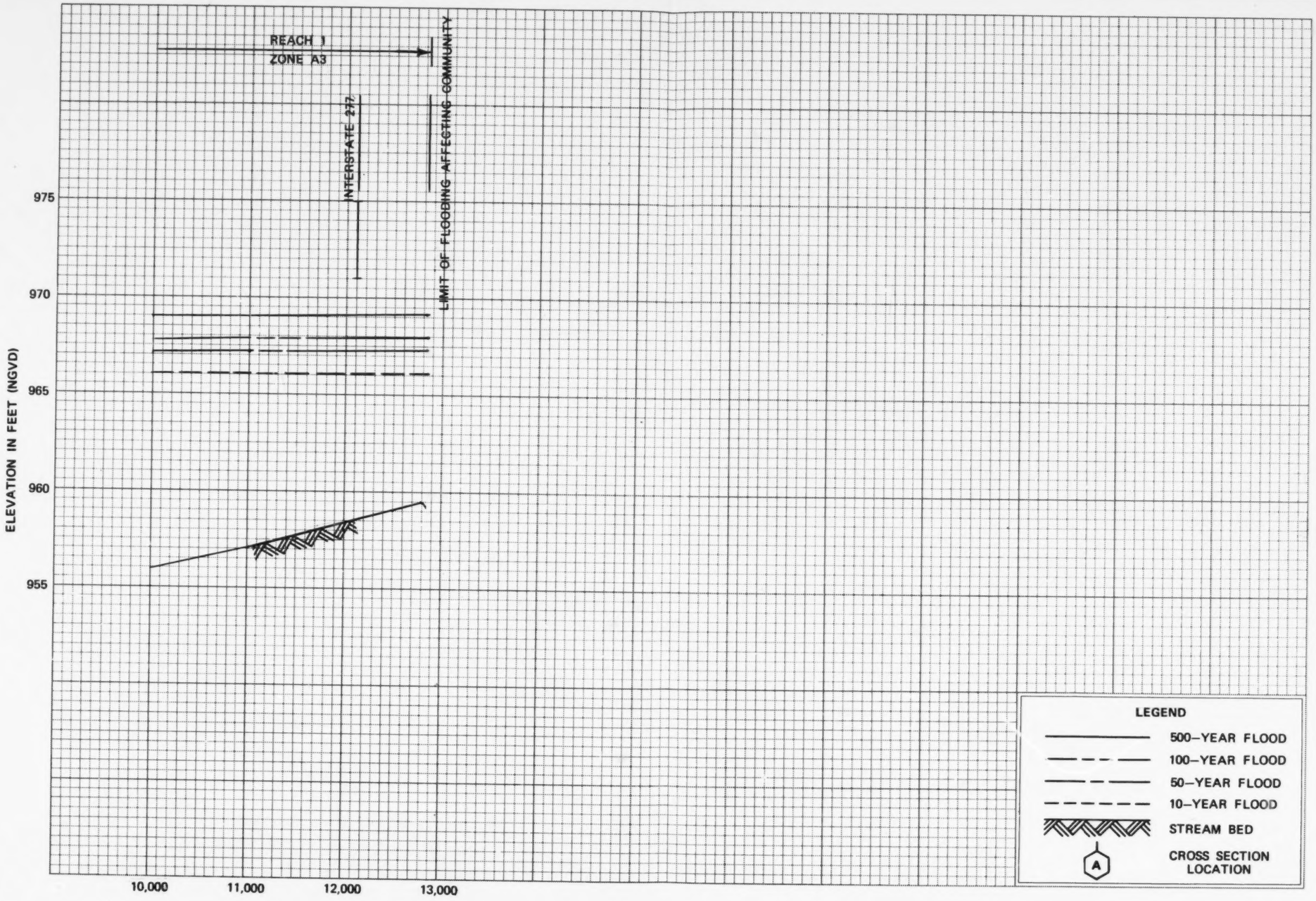


40P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

OHIO AND ERIE CANAL



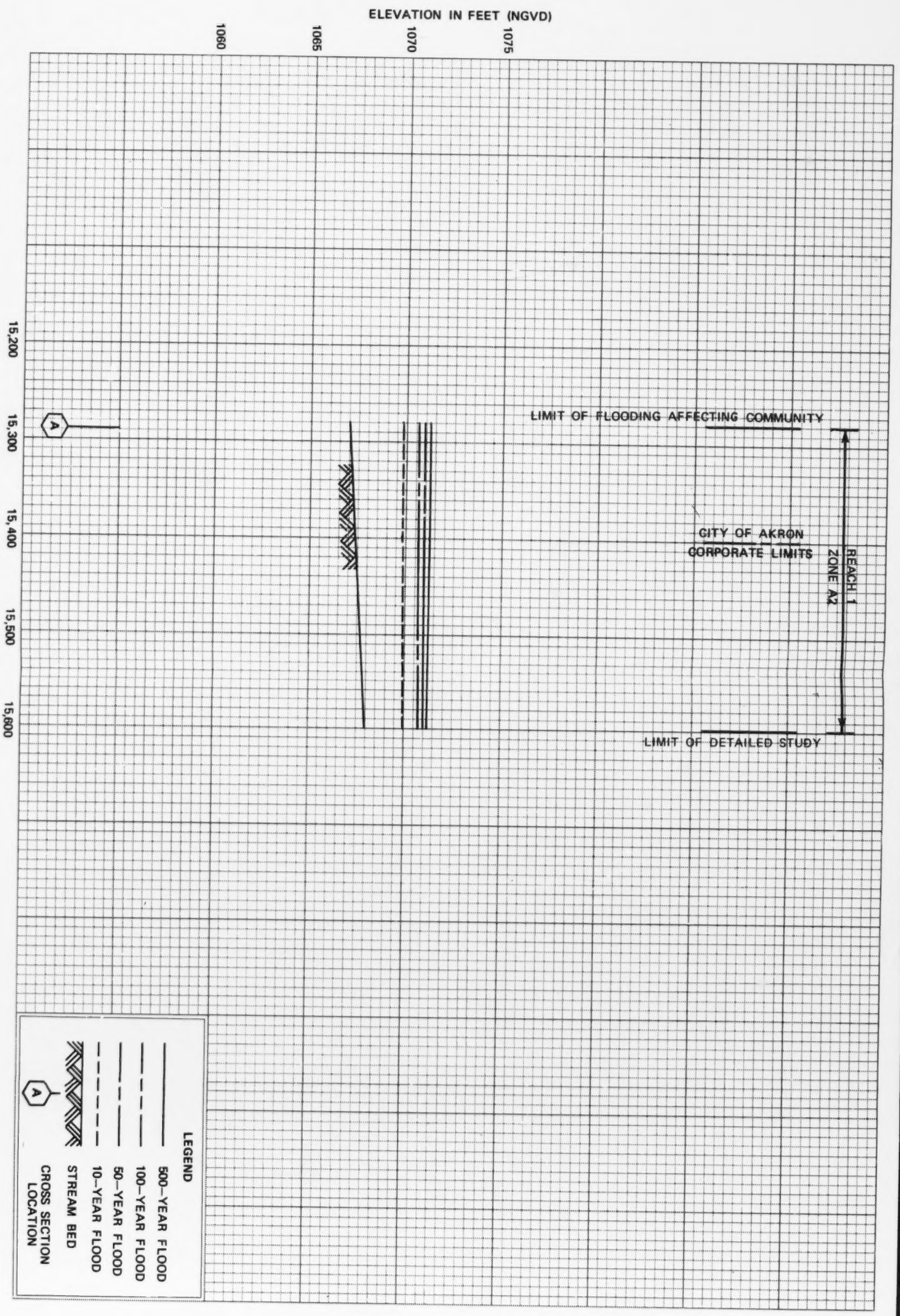
FLOOD PROFILES

OHIO AND ERIE CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

41P



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42P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF SUMMIT, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

SPRINGFIELD LAKE OUTLET